



ACQuiring Knowledge in Speech, Language and Hearing

Volume 12, Number 1 2010

Motor Speech Disorders

In this issue:

Advances in motor learning

Acquired motor speech
disorder in children

Assessment and treatment
of dysarthria

Behavioural treatments for
adults who stutter



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From the editors

Marleen Westerveld and Nicole Watts Pappas



Marleen Westerveld (left) and Nicole Watts Pappas

WELCOME TO ANOTHER EDITION OF ACQUIRING KNOWLEDGE IN Speech, Language and Hearing. The topic *motor speech disorders* has clearly attracted much interest. We have been impressed with the quantity and quality of the submissions we received in response to our call for papers related to this area of practice. All articles attempt to present our readers with an overview of current research and its applications for clinical speech language pathology practice.

McCabe introduces this issue of ACQ with an excellent overview of the advances in motor learning the profession has seen in the last couple of decades. This is followed by a number of peer-reviewed papers covering a range of related topics. Morgan provides a summary of current evidence in relation to assessment and treatment of dysarthria associated with childhood acquired brain injury, whereas McCormack and colleagues present a novel way of analysing children's own view of their speech impairment. In regards to the adult field, McCauliffe et al. examine the role of the listener in interactions with people with dysarthria and urge for consideration of familiar listeners' rating of intelligibility as an additional outcome measure of speech pathology intervention.

Sheedy and colleagues present several papers that address clinical treatment of stuttering in adults, while McIlwain, Madill, and McCabe apply principles of motor learning to voice therapy. The final article on motor speech disorders is by Goozée et al., which provides an excellent introduction to transcranial magnetic stimulation applications to the study and treatment of motor speech disorders.

This edition closes off with our regular columns, including a research update by Theodoros, a fascinating article on speech-language therapy in Viet Nam, and two very informative submissions from the Research Evidence Based Practice and Ethics Board committees. Finally, we would like to thank all those professionals who have assisted us with the peer-review process during our first 14 months of editorship. We look forward to continuing these working relationships and invite you to contact us with suggestions for future topics of interest.

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From the president

Moving on

Cori Williams



Cori Williams

THIS IS MY LAST COLUMN AS NATIONAL PRESIDENT

– a fitting time for reflection and thanks. The past three years have passed very quickly. It has been a busy time for me and for the Association. The range of activities of the Association in this time is wide, and it is not possible to mention them all here. I will mention some which are, to me, particularly important. The first steps into lobbying activity have been both exciting and demanding. We have much to learn, but I am confident that the profile of the Association and the profession is increasing, and that it will continue to do so. We are fortunate that our CEO, Gail Mulcair, is confident and skilled in this area. We have a re-vamped website to help us in our lobbying activities, and to provide a more efficient and informative service to members and the public. The Association has made a commitment to evidence based practice and to providing members with resources to assist them to access the very best in evidence. I believe it is crucial for the profession that we continue to position ourselves as scientist practitioners, and using the available evidence is integral to this. Our publications, the *International Journal of Speech-Language Pathology (IJSLP)* and *ACQuiring Knowledge in Speech, Language and Hearing (ACQ)* play an important role in this, as does the National Conference.

Speech Pathology Australia depends on the dedication and professionalism of its paid staff, and of the many volunteers who give their time for the benefit of the profession. Members of Branch Executive guide activities in their state and provide invaluable input also at the national level. I have been privileged to meet members from across the country and to hear their plans for their local area, their achievements, and their challenges. The forums and meetings are an important means of communication within the Association, and also within the branches. Should an invitation come your way, be sure to take it up!

I have also had the very great pleasure of working closely with members of Council to help to guide the strategic direction of the Association. Council members undertake an astonishing range of tasks, and do so with the very highest standards in mind. To all of you with whom I have shared time on Council, my thanks. Council meeting weekends can be (and have been) long – but I have admired the application

(and perseverance) which has allowed us to work efficiently through often long agendas, and to maintain an element of sanity in it all.

Thanks also to those staff at National Office, and paid staff in various parts of Australia, who make such a significant contribution to the functioning of the Association. Special thanks to Gail Mulcair, who has the difficult task of ensuring the smoothest possible functioning of National Office and the Association in general. She brings to the position of CEO a wealth of strategic and administrative knowledge.

What is ahead for the Association? I hope for continued movement from strength to strength, with growth in membership and an increasingly strategic focus. I am certain that the push for national registration and accreditation will continue, as will lobbying and advocacy activities. We will inevitably continue to be influenced by the vagaries of government and funding, but the focus on building understanding of the profession, and the needs of people with communication and swallowing disorders will be maintained.

I leave the position of National President with mixed feelings. I will certainly miss the inside knowledge of Association business, the involvement in strategic initiatives, and the interaction with staff and volunteers. At the same time, I look forward to the new enthusiasm and energy that will come with a new President. Chris Stone brings to the position valuable experience, having been a member of Council for a number of years. She holds a management position in the Victorian Health Department, and so will contribute a valuable skill set to Council discussion and to lobbying activities. I wish her every success, and trust that she will enjoy the position as much as I have.

I have learned an enormous amount during the past three years. Perhaps the most important thing that I have learned is the value of accepting a challenge. Involvement with your professional association is a challenge well worth taking up, and one which I hope many of you will enjoy. So what is ahead for me? I hope to spend more time working in the veggie garden, and sitting on my verandah watching the world pass by. But perhaps not straight away. I think I still have it in me to face another challenge or two.

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Editorial

Advances in motor learning: Emerging evidence and new ideas

Patricia McCabe

MOTOR LEARNING IN SPEECH PATHOLOGY COULD

refer to any area of practice which changes how a movement is made in relation to a communication or swallowing outcome. This obviously includes speech issues associated with articulation, apraxia, dysarthria, and fluency. However we can also think about motor learning in relation to voice therapy, swallowing intervention, or skilled use of augmentative and alternative communication (AAC). These areas of practice are thus about motor learning in a broader sense, as we endeavour to institute, change, or repair a set of learnt movements.

This motor speech issue of *ACQ* focuses on an area of practice that has often been neglected in both research and practice over the last couple of decades. Indeed, some of the treatments we use in motor speech come from the very foundation days of the profession. For example, most paediatric clinicians will use a variation of van Riper's (1939) stimulus approach as the basis for traditional articulation intervention. We are now witnessing an explosion in theoretical knowledge about how motor behaviours are learnt, processed, perceived, and stored. This new knowledge will in turn influence therapeutic approaches to motor intervention. This editorial will review some of the most promising areas of research (principles of motor learning, neurological plasticity, and mirror neurones) and hypothesise how motor interventions may change in the coming years.

Principles of motor learning

In recent years the term 'principles of motor learning' (PML) has appeared in the speech pathology literature. These principles derive from research in the fields of learning and motor rehabilitation. For a detailed review of PML see Maas et al. (2008). What do these principles tell us about motor learning? This paper is too short to go through all of them but three examples follow. First, there are two phases in learning any new motor skill – called prepractice and practice. *Prepractice* is the introduction of a new skill and practice is the period in which the skill is embedded as a habitual behaviour and generalised where appropriate. Second, to learn any new motor skill lots of varied practice is required. This might seem like an old idea but research is consistently showing that practice needs to occur, not over tens or hundreds of blocked trials, but over thousands of disseminated ones. So if you want a new speech sound to generalise then the client needs to practise, practise, practise. Implied in the concept of varied (or disseminated) practice is also a notion that clients should practise on multiple, related, randomised production targets; that is, simultaneously target the sound in initial, medial, final positions and possibly clusters. Randomisation allows for the development of a general motor plan rather than a context specific motor plan and is the key to greater learning.

Finally, we may need to change the way in which we provide feedback as well as its content. PML tells us

that feedback in the prepractice phase should be about how the person is making the sound or the error. Speech pathologists use this type of feedback frequently; however, the rub is that in the practice phase, feedback should *only* be on whether the target was correctly produced. This will require a change of behaviour for most clinicians and PML tells us that clinicians will need to practise their own new behaviour to institute this change. In addition, the client should only be told whether they got it right or not on randomly selected productions at a rate of less than 100% of productions (Hodges & Lee, 1999).

In the last three years there have been a number of papers which examine how these principles may apply generically to speech and voice interventions (e.g., Maas et al., 2008; McIlwaine, Madill, & McCabe, this issue), and new treatments which have been designed with PML as the underlying theoretical framework are being created (Ballard, Robin, McCabe, & McDonald, 2009). Therefore, PML may change our practice across movement disorders and provide a theoretical basis from which to make clinical decisions in the absence of high level evidence to guide practice.

Returning to traditional articulation intervention, it is interesting that in the era of evidence based practice most speech pathologists unquestioningly accept it as being best practice even though there are no large-scale, high level studies to support this assumption. A recent search (30 October 2009) of speechBITE (www.speechbite.com) provided 100 treatment papers in which articulation was a keyword. In 14 of these, traditional articulation intervention was examined most commonly as a control intervention against which a newer treatment was being compared. Three were regarding children with cleft and 11 were about otherwise typically developing children. Of these 11 papers none were systematic reviews, 4 were small randomised control trials, 3 were other types of control trials and the remainder were lower levels of evidence. Eight papers had been rated by speechBITE, and only two papers scored 5/10 indicating moderately rigorous research; the other papers were rated between 1/10 and 4/10 (lower levels of rigour). Most papers supporting traditional articulation intervention are thus low level evidence. However, recognition of this issue does not help us make clinical decisions as, like many areas of speech pathology practice, there are no alternate treatments available. What clinical experience tells us is that traditional articulation intervention generally works; however, articulation is a motor speech task and therefore PML might be applied to improve treatment efficiency and effectiveness.

To use PML in an articulation session we could, for example 1) only give cues about how to make the sound until the child gets a few productions correct (prepractice), 2) rapidly move on to feedback about correctness (practice), and 3) ensure that the client has mixed practice opportunities rather than repeated productions of the same



Patricia McCabe

carrier structure. In this way we can use recent theoretical research to guide practice in the absence of higher level evidence.

Neural plasticity

The two-cutting edge research areas presented here, neural plasticity and mirror neurones, underpin PML and provide new ways of thinking about motor based intervention across the board. The concept of neural plasticity is one which has emerged in neurology in the past few years and is the focus of a recent popular science book *The Brain That Changes Itself* (Doidge, 2007).

As late as the early 1990s it was widely believed that the brain did not repair itself after stroke or head injury, but we now know that brains have both adaptive and maladaptive repair processes operating continuously which can be harnessed in the rehabilitation process. Neural plasticity refers to these constantly engaged adaptive processes which allow us to learn new skills as a result of sensory input. This sensory information comes from our five primary senses but also, and importantly for motor learning, from our proprioception system including stretch receptors in muscles. When we damage our brains, or the sensory inputs to them, these adaptive processes continue to function and react to the distorted sensory input produced by the damage. This means that in the absence of normal function (motor or otherwise), the brain starts to use the available, but incorrect, information as the input and thus to lay down new learning based on this distorted input. The result is shifting of allocation of neurological resources, learning of new and disabling motor patterns, and ongoing loss of function. The longer this disrupted learning continues, the “better” these maladapted motor patterns are learnt (Pascual-Leone, Amedi, Fregni, & Merabet, 2005).

It now seems clear that rehabilitation should start on renewal of competent function as soon as possible and certainly within days of the initial neurological insult as the brain starts to change within 3–4 days of the changed input. To delay is to allow maladaptive learning to take place through reduced sensory input and through new motor patterns which may be created by compensatory strategies. In physiotherapy this means that comatose patients may have their limbs moved and muscles stretched and this not only helps prevent deep vein thrombosis (a medical goal) but also provides the brain with sensory input. This input is thought to help maintain brain function for the inert limbs and to prevent maladaptive neural plasticity from using the part of the sensory motor cortex allocated for the limb concerned for another function.

So how will neural plasticity change speech pathology practice? We might hypothesise that research will show that in treatment of dysarthria, the sooner you start near normal behaviours the better, or that with adults we need to use errorless learning so that maladaptive neurological changes are suppressed. Neural plasticity is emerging as a strong argument for both early and continued high frequency intervention in all aspects of motor learning.

Mirror neurones

Researchers are interested in a neurological construct known as “mirror neurones”. Mirror neurones fire when we watch someone else do an action and when we hear a sound commonly associated with an action (Iacobini, 2005). In

monkeys, firing of mirror neurones has been shown to increase learning and success in new motor activities without the monkey actually practising the task concerned (Rizzolatti & Craighero, 2004). The existence of these neurones would partially explain why modelling is an effective and natural part of many motor interventions and why imagining yourself completing an action can improve performance on this action, a concept well known in elite sports. Indeed, work in people with stroke has suggested that improved motor performance can be achieved through detailed imagining of movement (e.g., Yoo, Park, & Chung, 2001). In addition, one PML suggests that watching someone else learn how to do a task is more efficient than an expert modelling the behaviour (Hebert & Landin, 1994) and this principle may be explained by mirror neurones. It is possible that watching someone else learn leads the mirror neurones to simulate learning the action. Thus in the future we may develop a theoretical rather than economic justification for group intervention.

Integral stimulation (Strand & Skinder, 1999) is an example of a treatment which uses these hypothesised mirror neurones to aid learning. Two principles of this approach that may utilise mirror neurones include: 1) the clinician should sit very close to and directly opposite the patient so that the clinician’s face occupies most of the patient’s visual field, and 2) in the early stages of treatment, the clinician and patient say the target sounds simultaneously.

Conclusions

There are other areas of emerging knowledge for which we do not have space in this paper, but which are equally fascinating. These include constraint induced change, transcranial magnetic stimulation (as described in Goozée, this issue), and the role of the undamaged hemisphere in inhibiting recovery from brain damage. It is exciting to see areas of speech pathology practice that have been relatively dormant changing through the newly available understanding of how skilled movement is learnt and how the brain functions. Watch this space.

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Management of acquired motor speech disorder in children

A practical reflection on the evidence

Angela. T. Morgan

KEYWORDS

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MOTOR SPEECH

THIS ARTICLE HAS BEEN PEER-REVIEWED



Angela. T. Morgan

The term “acquired brain injury” (ABI) encompasses many debilitating neurological aetiologies, including stroke, encephalitis, traumatic brain injury, and brain tumour. Dysarthria is one communication impairment associated with ABI. In contrast with the adult field, limited data are available on the incidence, clinical features, and treatment techniques for acquired dysarthria in childhood. The aim of the present report is to provide an overview of current evidence regarding assessment and treatment of dysarthria associated with childhood ABI. A practically oriented discussion of what the evidence means for clinicians working in acute or rehabilitative practice is provided.

Assessment and diagnosis

A recent survey of 51 speech-language pathologists from 26 major paediatric rehabilitation centres across Australia, New Zealand, the United Kingdom, and Ireland explored current motor speech assessment practices (Morgan & Skeat, in press). The majority of clinicians (67%) reported that they were not satisfied with current motor speech assessments for children with ABI. The most commonly used standardised assessment tool was the *Frenchay Dysarthria Assessment* (Enderby, 1983) used by 74% of the group. The most commonly used informal diagnostic approach was the MAYO clinic diagnostic classification (Darley, Aronson & Brown, 1975; Duffy, 2005), used by 67% of clinicians surveyed. The limitations of using these tools with children are obvious, in that: i) both tools were designed for adults; and ii) only the Frenchay is standardised, yet based on adult performances only, making the psychometric data invalid for extrapolation to a paediatric population. Why are paediatric clinicians relying on adult-based tests? In short, because there are no tests available that have been standardised or developed specifically for children with acquired dysarthria.

Current evidence guiding assessment approaches

In the absence of an ABI specific paediatric dysarthria assessment, we must look to the broader paediatric motor

speech field to find alternative tools. The following section considers commercially and non-commercially available tools.

Commercial assessment tools

There are a number of commercially available standardised tests that purport to assess “motor speech” in children, implying that they assess both dysarthria and dyspraxia. Anecdotally however, clinical observations may lead one to surmise that the majority of paediatric motor speech assessments have a particular bent towards childhood apraxia of speech (CAS). In fact, this CAS bias was recently confirmed, based on data in a review paper by McCauley and Strand (2008). The authors evaluated the content and psychometric characteristics of standardised tests of nonverbal oral and speech motor performance in children. Criterion for inclusion of tests for review were that the test was: a) standardised; b) included young children (at or below elementary school age), c) addressed non-verbal oral motor/motor speech function, and d) available in July 2006 through a commercial source. Tests that were only focused on oral mechanism structure or sound system analyses were excluded.

Only six of the 22 identified assessments met criterion: i) *Apraxia Profile* (Hickman, 1997); ii) *Kaufman Speech Praxis Test for Children* (Kaufman, 1995); iii) *Oral Speech Mechanism Screening Examination* 3rd Ed. (St Louis & Ruscello, 2000); iv) *Screening Test for Developmental Apraxia of Speech – 2nd Ed.* (Blakely, 2001); v) *Verbal Dyspraxia Profile* (Jelm, 2001); and vi) *Verbal Motor Production Assessment for Children* (Hayden & Square, 1999). Even from the titles of these assessments, it is obvious that four of the six tests focus predominantly, if not exclusively, on CAS.

Overall conclusions from the review were that the tests varied markedly in both content and the methods of test interpretation (McCauley & Strand, 2008). Few tests documented reliability or validity data, even when this information may have been generated during the test’s development (McCauley & Strand, 2008). The VMPAC was the only assessment to provide “adequately described” normative data. It also came closest to meeting operational definitions for test-retest and inter-examiner reliability data, but did not fully meet them due to a lack of statistical detail. The VMPAC was also the only test to meet any of the three operational definitions for validation. Specifically, the VMPAC

met the operational definition for adequate content validity, but not for criterion-related or construct validity (McCauley & Strand, 2008). Hence, using assessment tool selection criteria based on psychometric properties, it appears that the VMPAC is the superior option for the assessment of motor speech impairment in children three to 12 years of age.

Current paediatric motor speech assessment tools (including those reviewed by McCauley & Strand, 2008) largely measure *impairment*. They provide little consideration of the child's everyday functional speech performance. Attempts to capture more functional aspects of speech performance are largely based on measuring intelligibility. Two commercially available standardised tools in the broader developmental speech field (i.e., not specifically designed for children with motor speech impairment) include the *Children's Speech Intelligibility Measure* (CSIM; (Wilcox & Morris, 1999) and the recent *Test of Children's Speech Plus – Sentence Measure* (TOCS+ SM; Hodge, 2008). The CSIM assesses intelligibility at a single word level, whereas the TOCS+ SM is based on sentences. Unfortunately, to the author's knowledge, a more naturalistic standardised assessment of spontaneous speech is not available.

Non-commercial assessment tools

The McCauley and Strand (2008) study reviewed only commercial assessment tools still available for purchase in mid-2006. This criterion is understandable because it would ensure that the tools of interest were still readily available to clinicians, and that they were not outdated. It is possible, however, that useful non-commercial assessment tools may exist. For example, the non-commercial but standardised *Oral and Speech Motor Control Protocol* (OSMCP; Robbins & Klee, 1987). While the OSMCP was reported in 1987, references to its use still appear in the clinical-research literature to date, including in speech genetic studies where strong phenotyping or behavioural descriptions of children's speech performance is required (e.g., Miscimarra et al., 2007; Stein et al., 2006).

The OSMCP was normed on 90 children, with 10 children included for each 6 month age band from 2;6 to 6;11 years. There is overlap in the particular tasks required of the child in the OSMCP and the VMPAC. One difference between the two assessments is that the OSMCP is explicit in associating structure or function with specific cranial nerves. The OSMCP may be useful for a clinician working on an acute ward who seeks a systematic tool to document cranial nerve function in children within this age range. There are multiple formal or informal non-speech oral motor or cranial assessments available, however to the author's knowledge, none have such extensive psychometric data (i.e., the OSMCP is standardised, and has examined test reliability, and inter-rater agreement).

Implications for clinical practice

The preceding review focused on oral motor or motor speech assessment tools that may be appropriate for use with children with acquired dysarthria. At a minimum however, childhood speech disorders call for a differential diagnosis of three key areas. Specifically, it is critical to determine whether and to what degree, i) structural anatomical, ii) developmental and/or iii) neurologically-based oral motor and motor speech factors are involved in the presenting speech impairment; see box 1 for an example of an assessment protocol.

Box 1. Example protocol for assessment of motor speech (dysarthria) in ABI

1. *Oro-facial structural exam* (e.g., OSMCP; selected items from OSMCP or VMPAC)
2. *Developmental speech production*, i.e., articulation and phonology (e.g., *Goldman Fristoe Test of Articulation – 2*, Goldman & Fristoe, 2000; *Diagnostic Evaluation of Articulation and Phonology*, Dodd, Hua, Crosbie, Holm, & Ozanne, 2006)
3. *Motor speech examination*
 - *Oral motor/non-speech function* (e.g., selected non-speech items in VMPAC Global motor control, Focal motor control, Sequencing subtests; or selected non-speech items in OSMCP)
 - *Motor speech production* (e.g., selected speech items in VMPAC or OSMCP)
 - *Functional speech measure* (e.g., CSIM, TOCS+ SM)

Treatment

Treatment for acquired dysarthria aims to effect sustained improvement in the speech system following brain injury, utilising principles of neural plasticity.¹

Current evidence guiding treatment approaches

Recently, a Cochrane Collaboration review evaluated the efficacy of treatments for dysarthria associated with ABI in children aged three to 16 years (Morgan & Vogel, 2008). The review systematically identified that there are only 2 empirically driven studies in this field to date: 1) a single case ABAB study design focused on respiratory-based treatment for dysarthria (box 2; Murdoch et al., 1999), and 2) a case series ABA study design focused on an articulatory-based treatment (box 3; Morgan et al., 2007).

Box 2. Treatment example summary A (Murdoch et al., 1999)

- *Participant*: 12.5 year old with TBI post MVA
- *Time post-injury*: 2.5 years
- *Speech diagnosis*: mixed spastic-ataxic flaccid dysarthria (with severely impaired respiratory function)
- *Study design*: single case ABAB design
- *Key therapy goals*: i) increase control of inhalation and exhalation; ii) improve co-ordination of phonation and exhalation
- *Treatment technique*: B1: Traditional therapy (included non-speech and speech tasks focused on establishing appropriate sub-glottal air pressure and enhancing the participant's inhalation and exhalation control); B2: Visual biofeedback (included using a RespiTrace plethysmograph to provide visual feedback of speech breathing while performing similar tasks to those in B1)
- *Treatment dose*: B1: 8 x 30-45 minute sessions of traditional therapy across 2 weeks followed by a 10 week withdrawal period; B2: 8 x 30 minute sessions of respiTrace (with visual biofeedback) over 2 weeks
- *Post-treatment result*: real-time continuous biofeedback treatment was effective and superior to traditional therapy for modifying speech breathing patterns in this case

TBI: traumatic brain injury, MVA: motor vehicle accident;
ABAB: A = assessment, B = treatment

Box 3. Example of treatment summary B (Morgan et al., 2007)

- *Participants:* 3 adolescents (aged 15;0, 14;10 and 15;1 years) with TBI post MVA
- *Time post-injury:* 5, 2.5 and 2.5 years post TBI respectively
- *Speech diagnoses:* mild spastic dysarthria, moderate spastic dysarthria, and severe mixed spastic-ataxic dysarthria (all with severe articulatory deficit)
- *Study design:* case series ABA design
- *Key therapy goal:* increase accuracy of spatial phonetic targets
- *Treatment technique:* a hierarchy of speech tasks (single syllable to sentence level) using electropalatography (EPG) with visual feedback to treat articulatory deficit
- *Treatment dose:* treated for 1 hour, once per week, for 10 weeks
- *Post-treatment result:*
 - perceptual improvement for phoneme precision and length; spatial EPG measure confirmed improved phoneme precision
 - intelligibility increased at word and sentence level, with little change reported in everyday speech intelligibility

Implications for clinical practice

The available empirically driven treatment studies in this field are single case (Murdoch et al., 1999) and case series studies (Morgan et al., 2007), and are therefore limited in their generalisability to other patients with ABI. Yet, the preliminary results from both studies are encouraging, with speech improvements being documented post-treatment. Here the two studies are used as a discussion point to illustrate the application of recently outlined principles of neural plasticity (see Kleim & Jones, 2008; Ludlow et al., 2008 for further reference and full definitions of the principles discussed throughout this section) in planning clinical dysarthria intervention for children with ABI.

Positive changes in speech function were noted for all four cases across the two studies. None of the cases in these studies had been receiving any form of systematic or regular therapy immediately prior to engagement in the clinical-research study. It is possible at one level therefore that change occurred due to the introduction of a treatment where one had previously been absent. This is elucidatory of the neural plasticity principle of *use of function*, or “use it or lose it”.

What else is special about the application of a specific treatment to enable it to result in change? What other factors should be considered when designing dysarthria treatment? A number of other factors implemented in the two therapy reports discussed here may have helped to effect change, as outlined below.

Unlike the random use of speech in daily life, study participants were required to practise or repeat a particular skill using a drill approach, illustrative of the neuroplasticity principle of *repetition of training*. Children were also required to practise skills that met the principle of being salient or experience specific. For example, some have advocated oral-motor treatment for articulatory-based dysarthric deficits. There has been growing debate however, that oral motor and speech motor function are not controlled by the same neural substrates (e.g., see Ziegler, 2003 for review). As such, it has been suggested that training oral motor function for articulatory impairment in dysarthria (i.e., for sub-types of dysarthria other than flaccid dysarthria where there may well be a weakness of oral motor function) is not experience specific or salient enough to effect changes in

speech function. That is, nothing is as beneficial in changing speech, as training in speech itself. The exemplars here involved real speech practise (as opposed to isolated oral motor or respiratory function tasks) at each stage of therapy (Murdoch et al., 1999; Morgan et al., 2007).

While change may occur due to repetition or practice of salient features, some degree of *intensity* of practice over a particular duration is thought to be required to effect sustained change. Neither study of interest conducted long-term follow-up assessments to determine the success of carry-over of treatment into the longer-term. Of course data is too scarce to be able to advocate a particular treatment intensity at this stage; however, it is encouraging that treatment programs of 8 sessions over 2 weeks (Murdoch et al., 1999) or 1 session per week for 10 weeks (Morgan et al., 2007) were of sufficient intensity to effect some degree of change at least by the end of the therapy block.

Another neural plasticity principle to consider is the *onset of treatment*. It is likely that the propensity for recovery of dysarthria is greatest during the first 12 weeks post-injury as seen for other disorders such as dysphagia (Morgan, Ward, & Murdoch, 2004) and for general neural recovery (Barnes, 1999) where we typically witness a marked degree of “spontaneous” or rapid recovery. It is typically inappropriate to intervene at this stage however due to other medical and cognitive co-morbidities. However, it was heartening that treatment was able to effect positive change in the speech system for as long as up to 5 years post-injury (Murdoch et al., 1999; Morgan et al., 2007). While replication studies are required to confirm the findings of this early work, the preliminary evidence suggests that we should continue to provide patients with systematic, well-designed treatment programs even when referred to us as outpatients with chronic dysarthria. That is, just because the dysarthria is persistent, it may not be intractable.

To best illustrate the principle of *age effects on training*, it would be optimal to compare treatment performance in a group of younger versus older children (e.g., < 5 years vs > 5 years). In fact, some may argue that children in both studies discussed here (aged approximately 10 to 12.5 years at the time of brain injury) actually have adult-like systems and would have consolidated the motor skills for speech prior to the onset of injury. Hence, it could be speculated that these older children have responded to treatment because they found it easier to re-organise or adapt to a previously established skill. Children who sustained injury at earlier ages when they were still developing a particular skill may have found it more challenging to re-acquire or rehabilitate their motor speech function. Again, a lack of evidence precludes us from predicting whether a younger or older age at onset of injury will lead to better or worse outcomes. It is important for future studies in our field to directly consider this issue.

The final two neural plasticity principles for consideration are *transference* and *interference* of training. The example studies discussed here, being single case studies, are too limited in terms of statistical power to enable us to make a clear decision on whether treating one particular area (e.g., respiration) had a positive or negative impact on other speech sub-systems (e.g., velopharyngeal function). Nevertheless, it is important to keep these principles in mind when designing treatments. For example, one may hypothesise that it would be beneficial to work on the speech sub-systems of respiration and phonation in a single session because the two skills arguably overlap more at a neurophysiological level than other skills, and hence some transference may be expected. It may be hypothesised that working on oral motor and respiratory function together in

a single session would be less complementary, and may actually result in interference of motor skill learning in one or the other domain.

In summary, there are too few studies, and no well-controlled (i.e., quasi-randomised or RCT) studies, of treatment for childhood-acquired dysarthria. At present, clinicians are heavily reliant upon adapting adult-based dysarthria treatments (e.g., see Academy of Neurologic Communication Disorders and Sciences) for use with children. Using the only available empirical data in the paediatric field, the present overview was designed to illustrate how we might consider recently outlined principles of neural plasticity (Kleim & Jones, 2008; Ludlow et al., 2008) when designing individual treatment programs for children with acquired dysarthria.

Summary and conclusions

As for many fields within speech pathology, there is an impoverished research evidence base underpinning clinical management of children with acquired dysarthria. The required future directions for research have been discussed elsewhere (Morgan & Vogel, 2008) and are beyond the scope of this clinically focused report. It was the aim of this paper to provide an overview of recent evidence in childhood acquired dysarthria, and its implications for guiding assessment and treatment approaches in clinical practice. The present review supports clinicians to consider the application of a systematic and evidence based approach to management of childhood dysarthria associated with ABL.

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1. Neural plasticity: "the ability of the central nervous system to change and adapt in response to environmental cues, experience, behaviour, injury, or disease" (Ludlow et al., 2008, p. S240).

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A different view of talking

How children with speech impairment picture their speech

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KEYWORDS

CHILDREN

DRAWINGS

QUALITATIVE RESEARCH

SPEECH IMPAIRMENT

THIS ARTICLE HAS BEEN PEER-REVIEWED

The views of children with speech impairment are often unheard during speech pathology assessments and intervention due to concerns about the children's age and level of intelligibility. This paper presents the views of 13 preschool children with speech impairment who participated in the Sound Effects Study. Children drew pictures of themselves "talking to somebody" as part of a comprehensive communication assessment, and were interviewed about their talking. Drawings and interview transcripts were analysed to investigate the way in which children view their speech. Findings indicate that drawings and interviews are valuable modes for accessing the views of children, which is an important aspect of truly child-centred clinical practice.

Three recent large-scale Australian studies have found that approximately one in five preschool children is identified by their parents or teachers as having difficulty "talking and making speech sounds" (McLeod & Harrison, 2009; McLeod, Harrison, & McAllister, 2009; Ttofari Eecen, Reilly, & Eadie, 2008), and the most commonly identified difficulty is speech that is "unclear to others" (McLeod & Harrison, 2009). Many children with speech difficulties are referred to speech pathology clinics for assessment and intervention. Increasingly, speech pathologists aim for a "family-friendly" approach to the clinical management of these children (Watts Pappas, McLeod, McAllister, & McKinnon, 2008), encouraging the input of caregivers in the management process. They have not, however, routinely investigated the views of the children with speech impairment regarding their speech and their goals for intervention.

Since the United Nations Convention on the Rights of the Child (UNICEF, 1989) was ratified, there has been a growing awareness of the need to include the views of children in issues that affect them. However, accessing the views of preschool children with speech impairment has typically been considered a difficult task, due to their age and their level of intelligibility (Markham, van Laar, Gibbard, & Dean, 2008). The use of drawings has been recommended by early childhood researchers as a way of enabling children to express themselves and facilitating researchers' access to children's views (Einarsdottir, Dockett, & Perry, 2009; Holliday, Harrison, & McLeod, 2009). For children with speech impairment, activities such as drawing provide a means by which they can express their thoughts and feelings in a non-verbal manner.

Investigating and understanding the views of children with speech impairment has important clinical implications. The decision to seek and receive intervention for young children with speech impairment is typically made by parents or teachers on behalf of these children. The children themselves have not sought intervention and may not perceive anything wrong with their speech (McCormack, McLeod, McAllister, & Harrison, 2009). For speech pathologists, understanding the views of both the child with speech impairment and their family is necessary in order to develop intervention that addresses the problems perceived and experienced by both in communication interactions.

The aim of this study was to explore the views of children with speech impairment about their speech and difficulties associated with talking using three methods: drawings, yes/no questionnaires, and interviews.



Method

Participants

The participants were 13 preschool children (9 males and 4 females; see table 1), who were purposefully selected from children ($n = 143$) taking part in the Sound Effects Study investigating speech impairment in early childhood (McLeod et al., 2007–09). The children (mean age 4;7) were all identified by parents and/or teachers as having “difficulty talking and making speech sounds”. Each child was given a pseudonym to protect their identity.

Measures and procedure

The assessments for the Sound Effects Study were conducted by a qualified speech pathologist in a quiet room in the child’s preschool or childcare centre. Children were accompanied by a familiar adult, usually a parent. Parents provided consent for their children to participate and children gave assent, following a description of the task.

Communication assessments lasted approximately 1–1½ hours and took place over 1 to 2 sessions, depending on the child’s concentration during the tasks. The children’s

speech skills were assessed using the Diagnostic Evaluation of Articulation and Phonology (DEAP; Dodd, Hua, Crosbie, Holm, & Ozanne, 2002). The communication assessment also included screening of receptive and expressive language, hearing, oromusculature, nonword repetition, pre-literacy skills, voice, and fluency.

Three tasks were then undertaken to determine children’s views of speech. First, the Kiddy-Communication and Attitude Test (KiddyCAT; Vanryckeghem & Bruten, 2007) was administered to investigate the children’s perceptions of their speech ability and difficulties they had with talking. The KiddyCAT is a standardised assessment for children aged 3–6 years. The test comprises 12 yes/no questions, including “Is talking hard for you?” and “Do you think that people need to help you talk?”

Upon completion of the KiddyCAT, the children were given a blank piece of white A4 paper and 10 coloured textas and invited to draw a picture of themselves talking to somebody (see Holliday, 2008 for the protocol). As the child drew, the speech pathologist transcribed verbatim comments from the children. She also drew a replica of the

Table 1. Participant characteristics and results from KiddyCAT, drawing and interviews

Name*	Sex	Age	PCC	KiddyCAT			Total KiddyCAT score (/12)	Drawing		Interview	
				Do you like to talk?	Is talking hard for you?	Do you think people need to help you talk?		Focal points	Faces – how I feel about talking	Faces – how I feel about talking	Faces – how I feel when not understood
Wade	M	4;1	42.1	Y	Y	Y	7 (outside normal range)	Accentuated body features	Happy, sad	Happy	In middle
Grace	F	4;3	53.2	Y	N	N	0 (WNL)	Sense of self	N/A	N/A	N/A
Patrick	M	4;3	34.3	N	N	N	6 (outside normal range)	Did not draw self	All, happy	Don’t know	In middle
Gus	M	4;3	47.8	Y	N	Y	3 (WNL)	No partner; facial expression	Sad	Happy	Happy
Ewan	M	4;3	40.3	Y	Y	Y	6 (outside normal range)	No partner; colour	Sad, happy	Happy	Sad
Kara	F	4;4	78.4	Y	N	Y	4 (WNL)	Colour	Happy	Happy	Happy
Owen	M	4;6	17.9	Y	Y	N	3 (WNL)	No partner; facial expression	Don’t know	In middle	Sad
Matt	M	4;6	51.8	Y	N	Y	2 (WNL)	No partner; facial expression	Happy	Happy	In middle
Zac	M	4;9	67.1	Y	Y	Y	5 (outside normal range)	Sense of self	Happy	Happy	Sad
Fenn	M	4;11	55.7	Y	Y	N	3 (WNL)	Sense of self; accentuated body features	Happy	Happy	Happy
Evelyn	F	4;11	56.8	Y	N	N	3 (WNL)	Sense of self	In middle	Happy	Happy
Jamie	M	5;0	74.1	Y	Y	Y	4 (WNL)	Sense of self	In middle	In middle	In middle
Lilah	F	5;9	74.1	N/A	N/A	N/A	N/A	Sense of self	Happy	Happy	Don’t know

*Pseudonyms have been used to protect the identity of participants, WNL = within normal limits, PCC = percent consonants correct, Y = yes, N = no, N/A = not available

child's drawing and labelled it accordingly. The children were then asked questions about their drawing (e.g., "Who is in the drawing?", "Do you like talking to this person?") and were asked to identify how they felt about talking. Children were provided with visual prompts (e.g., faces showing a range of emotions: 😊😐😞, a blank face for "other feelings" and a question mark signifying "don't know") to assist in answering.

On another occasion, 13 children were interviewed. Twelve of the interviews were conducted by the same speech pathologist who conducted the communication assessments. A teacher with special education training conducted the remaining interview. Interviews were conducted face-to-face in a location that was familiar to the child (e.g., home or early childhood centre) with a familiar person nearby. Interviews followed a semi-structured format (Minichiello, Aroni, & Hays, 2008). Questions were based on the Speech Participation and Activity Assessment – Children (SPAA-C) "Questions for children" (McLeod, 2004). Children were again requested to identify how they felt about the way they talk, and how they felt when talking in specific contexts (e.g., to parents, siblings, friends and teachers).

All assessments and interviews were audio-recorded with the consent of both child and adult participants using a Sony MP3 digital recorder (ICD-UX80), and were transcribed and checked by the interviewer.

Data analysis

Drawings

A meaning-making approach was used to determine how children perceive "talking." This approach recognises the importance of consulting children and having them explain their drawings. Each child's drawing and their explanation of the drawing was examined in terms of the meaning they conveyed, particularly in relation to how the child conceptualised their talking. Holliday et al. (2009) identified six potential key features or focal points that may be present in the drawings of children with communication impairment. These included: talking and listening, accentuated body features (mouth, eyes, ears), facial expressions, colour and vitality, sense of self, and negativity (e.g., no conversational partner, scribbling). These focal points were noted in the drawings completed by children in this study and were used to develop themes across the children's drawings.

Interviews

A phenomenological approach (Minichiello et al., 2008) was used to analyse the interview transcripts. Using this approach, the researchers attempted to understand the meaning of the phenomenon (living with childhood speech impairment) from the children's descriptions of the experience. Techniques used to ensure rigour in the analysis



Figure 1. Wade's (4;1) drawing of himself with his brother (eyes coloured and mouth on left). Wade's description of this picture was not intelligible [PCC = 42.1].



Figure 2. Grace's (4;3) drawing of herself (right) talking to her mum about "going across to the park" [PCC = 53.2].



Figure 3. Patrick's (4;3) drawing of Henry the Octopus [PCC = 34.3].



Figure 4. Gus' (4;3) drawing of himself talking to his dog (not pictured) at home [PCC = 47.8].



Figure 5. Ewan's (4;3) drawing of himself. When asked who he liked talking to he replied "Mummy and Daddy...and my dog". Ewan felt sad about talking to others because "they don't let me play" [PCC = 40.3].



Figure 6. Kara's (4;4) drawing of herself (right) with her cousin. Kara is "hula-hooping with my new sparkly hula hoop" [PCC = 78.4].

included immersion in the data (e.g., re-reading of transcripts), constant comparative analysis (e.g., checking analysis of one transcript with another), and triangulation of methods (e.g., comparing data obtained from assessments with drawings, observations and verbal responses during interviews). Key words and content in the interview transcripts were used to identify themes, which were independently checked by two of the other authors.

Results

Speech assessment

Twelve of the 13 children presented with a percentage of consonants correct (PCC) that was below the normal range (i.e., standard score less than 7) on the DEAP Phonology subtest, and one child was within the normal range (standard score of 7). The PCC produced by the 13 children in this study ranged from 17.9 to 78.4 (mean 53.4).

KiddyCAT assessment

The KiddyCAT was administered with 12 of the 13 children, as it had not been included in the protocol when the other child (Lilah) was assessed. Children's scores ranged between 0 and 7 (see Table 1), with eight children obtaining scores that placed them within the normal range (0–5 out of 12), indicating positive feelings about communication.

Drawings

One child (Patrick) chose to draw a picture of Henry the Octopus. His drawing was excluded from the analysis because he did not draw himself talking. Four focal points were identified to be consistent across the other 12 drawings (see Figures 1–12).

Focal point 1 – Accentuated body features

The children's drawings showed their awareness that features such as the mouth and ears are important in communication. In Fenn's drawing of himself talking to his friend he accentuated his friend's ears, highlighting the importance of listening when conversing (see Figure 10). In Wade's drawing of himself and his brother, he accentuated their mouths, eyes (coloured in) and ears (above eyes) (see Figure 1).

Focal point 2 – Facial expressions

The children also indicated that communicating can be a happy, sad or neutral process. Owen, Gus, and Matt all drew pictures of themselves talking without conversation partners, and the different facial expressions they portrayed as well as their descriptions of the drawings suggest their feelings about talking. Matt drew a happy face and stated that he was talking to his "best friend" (not pictured) about "going to Nan and Pop's house" (see Figure 8). In contrast, Owen drew a neutral expression and stated that he was talking to



Figure 7. Owen's (4;6) drawing of himself talking to the speech pathologist (not pictured). Owen stated he didn't like talking to anybody [PCC = 17.9].



Figure 8. Matt's (4;6) drawing of himself talking to his "best friend" (not pictured) about going to "Nan and Pop's house" [PCC = 51.8].



Figure 9. Zac's (4;9) drawing of himself (left) talking to his mother about the "city" [PCC = 67.1].



Figure 10. Fenn's (4;11) drawing of himself (right) talking to his friend about "tissues" [PCC = 55.7].



Figure 11. Evelyn's (4;11) drawing of herself (left) talking to her sister, who is sitting on a "seat" [PCC = 56.8].



Figure 12. Jamie's (5;0) drawing of himself (left) talking to a boy in his class about "taking care of him" [PCC = 74.1].

the speech pathologist about “nothing” (see Figure 7). When asked who he liked talking to Owen said “no one.” Gus drew himself talking with his dog at home (see Figure 4). The absence of a second figure and his negative facial expression may suggest Gus does not feel happy about talking.

Focal point 3 – Colour

There was a great degree of individuality regarding the use of colours. Kara’s drawing of herself with her cousin reflects happiness with talking, which is evoked through the smiling faces, vibrant colours and background detail (see Figure 6). Kara explained that she is “playing outside ... whirling in my new hula hoop that I got for my birthday.” In contrast, Ewan, who liked talking to “Mummy, Daddy and to my dog” drew only himself, and used only a black texta (Figure 5).

Focal point 4 – Sense of self

Most children portrayed a positive sense of self in their drawings, through drawing themselves a similar size and in similar detail to their conversation partner. They portrayed themselves as happy when talking to family and friends, with the inclusion of smiles, colour and by drawing people close together. Grace drew herself talking with her mother about “going across the road to the park” (see Figure 2). Grace drew the figures with similar features and standing close together.

Faces – “How do you feel about talking?”

Eight children indicated they felt “happy” about talking and one (Gus) indicated that he felt “sad.” One child (Owen) responded that he “didn’t know” how he felt about talking, and three indicated more than one response (e.g., happy and sad). Data were unavailable for Grace.

Interviews

Phenomenological analysis of the interviews revealed two themes. First, the children were aware of “problems” when communication breaks down, and second, they used strategies to “solve” the problems. When asked to colour in a face in response to the question “How do you feel when other people don’t understand you?”, Owen, Zac, and Ewan coloured the “sad” face, while Wade, Patrick, Matt, and Jamie coloured “in the middle”. This suggested they perceived a problem when they weren’t understood. However, children did not identify their speech as the cause of communication problems. When asked to colour in a face in response to the question “How do you feel about the way you talk?” most children coloured the “happy” face, except Jamie and Owen (“in the middle”) and Patrick (“don’t know”). No children indicated that they felt “sad”. Kara alone identified she had a speech problem during the interview, stating “I can’t say Tara. I say Tara when I’m saying my name.” Furthermore, Kara identified the role of the listener in communication breakdowns, stating “I keep say ... and they don’t know what’s my ... they keep saying they think my name’s Tara.” For Kara, part of the problem she perceived was that the listener did not understand her. Other children implied that listeners may have problems “hearing” and suggested solutions. For instance, when asked what they do when others don’t understand them, Gus responded, “Speak up a bit” and Evelyn said, “Say it another time.” During the interviews, Fenn and Wade were observed to repeat their utterances to help the interviewer hear (and understand). Additional analyses of these children’s interviews can be found in McCormack et al. (2009).

Discussion

The results from this study showed that preschool children with speech impairment can express views about their speech in non-verbal (drawings) and verbal tasks (yes/no

questions, interviews with visual prompts). Analysis of these tasks revealed common themes. First, children were generally happy about talking and about the way they talk. This was evident through their use of colour and facial expressions in the drawings, and their responses to interview and KiddyCAT questions. In the latter, all except Patrick reported that they “liked to talk”.

Second, despite being identified as having speech difficulties by their parents and teachers, and despite confirmation on the formal speech assessment (for all except Kara), most of the children did not perceive themselves as having speech difficulties. In the KiddyCAT assessment, they reported talking was not “hard” for them. A positive sense of self was also evident in their drawings, where children drew themselves as similar to their conversation partners.

Finally, children showed awareness of the need for both the mouth (talking) and ears (listening) when communicating. Fenn and Wade drew and identified both these facial features in their drawings, while Kara identified the need for the mouth and ears by identifying faults in the speaker and listener when communication breaks down.

Traditional speech pathology practice focuses on “correcting” speech skills (Van Riper & Erickson, 1996). However, young children who do not perceive a problem with their speech skills (but rather with their communication partner’s listening) may be reluctant to participate in intervention that focuses on themselves as the speaker. In this study, five children indicated that they did not think people needed to help them talk. Three of these children (Grace, Patrick, and Evelyn) also indicated that talking was not difficult for them, despite obtaining PCC scores of 53.2, 34.3 and 56.8 respectively. Increasing children’s awareness of speech errors through metacognitive strategies as in Metaphon (Dean & Howell, 1986) and Parents and Children Together (PACT; Bowen & Cupples, 1998) may motivate participation in intervention. However, two children (Owen and Fenn) who identified talking was “hard” did not think people needed to help them talk. Thus, making children aware of the speech problem will not guarantee their motivation to visit the speech pathologist.

Furthermore, increasing children’s awareness of their speech problem does not address the problem of listeners needing to understand the child’s message while the speech problem is being resolved, or the child’s frustration when he/she is not understood. A more holistic intervention approach could incorporate strategies that enabled others to understand and to minimise frustration (e.g., creating and using available cues such as a diary to share knowledge of events, or a list of child’s typical productions of words), alongside strategies that aimed to improve the child’s speech (Most, 2002; Pretty, 1995).

Limitations

The themes described in this study emerged from across the participant sample; however, triangulation of methods revealed inconsistency for some individual participants. For instance, Gus obtained a KiddyCAT score which suggested a positive attitude towards talking, but after drawing his picture, he circled a “sad” face in response to the question about how he felt about talking. Dockett and Perry (2007) suggested that different data obtained from the same children should be considered valid, and researchers should accept that children, like adults, may have many different perspectives on the same issue “rather than seeking ‘one truthful perspective’ from children” (p. 49). Accordingly, rather than perceiving inconsistencies in the data as a limitation of this study, the authors accept that the data reflect the way children’s views develop and change, and are

influenced at all times by contextual factors (Daniel & McLeod, 2006). Furthermore, the authors recognise the importance of multi-method approaches when researching with young children, in order for the research to reflect the different perspectives of those children.

Conclusions

The findings from this research exemplify the valuable information that children can provide and support the inclusion of children in research about them. The findings also support the use of a range of methods to understand children's views, when verbal communication may be difficult. This study revealed that children perceive talking as a happy experience and may hold different views from their parents, teachers and speech pathologists regarding their speech impairment.

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Consideration of the listener in the assessment and treatment of dysarthria

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THIS ARTICLE HAS BEEN PEER-REVIEWED

Traditionally, speech production deficits have been the focus of clinical practice and research in dysarthria. However, recent research has begun to examine the role of the listener in communication interaction. This article provides an overview of perceptual processing theory relevant to dysarthria. In addition, it discusses the relationship of current theoretical models of speech perception to the assessment and treatment of dysarthria. Finally, it provides insight into how this information may inform current clinical practices and future research in the field.

Regardless of severity, the reduced ability to communicate effectively has detrimental effects on the social, family, and vocational life of the individual and their whanau¹ (Theodoros et al., 2001). The presence of dysarthria can result in significant isolation for the individual affected (Hartelius & Svensson, 1994) and has been reported as one of the most distressing symptoms of neurologic disease (Duffy, 2005).

The role of the listener in assessment and rehabilitation

Central to speech pathologists' diagnosis and treatment of dysarthria is the concept of *speech intelligibility*. Intelligibility refers to how well a person's speech is understood by a listener. Traditionally, intelligibility deficits have been considered in relation to the speech disorder of the person with dysarthria. On this basis, much of what is known of the nature of speech deficits in dysarthria, and its treatment, has focused on the production aspects of the disorder (e.g., McAuliffe, Ward, & Murdoch, 2006; Wang, Kent, Kent, Duffy, & Thomas, 2009). However, the speech signal of the person with dysarthria forms only one component of intelligibility; the environment in which communication takes place and the listener's background knowledge and perceptual strategies also play a significant role (Liss, 2007).

On this basis, research has begun to explore the contribution of the listener to speech intelligibility in dysarthria. Studies have focused on listener comprehension of deviant speech (Hustad & Beukelman, 2002), consistency of scoring paradigms utilised by listeners (Hustad, 2006), listener strategies to understand dysarthric speech (Klasner & Yorkston, 2005), the effect of speech supplementation strategies on listener attitudes (Hanson, Beukelman, Fager, & Ullman, 2004) and the effects of listener familiarity or experience with dysarthric speech in explaining variations in listener performance (DePaul & Kent, 2000; Liss, Spitzer, Caviness, & Adler, 2002).

A significant body of literature exists in the field of *speech perception* with various models attempting to account for listeners' comprehension of running speech (see Liss, 2007, for a review). Interestingly, very few studies have examined the ability of the listener to decipher the disordered speech signal of dysarthria, or used theoretical models of speech perception to explain results, even though the aptitude of the listener and their ability to comprehend² the disordered speech is crucial to communication success. The potential benefit of this body of research to the improvement of existing therapy techniques and the development of new strategies remains underdeveloped. The remainder of this

Dysarthria refers to a group of disorders that result from disturbances in the neuromuscular control of speech production. When occurring in isolation, it is associated with impaired motoric speech activity in the presence of normal cognitive-linguistic activity. Dysarthria is a common consequence of acquired neurological impairments including stroke, neurodegenerative disease, and brain injury. While it may affect individuals of any age, dysarthria is commonly exhibited by older adults. Conservative estimates indicate that approximately 20–30% of people will exhibit dysarthria post-stroke (Warlow et al., 2000) or following brain injury (Theodoros, Murdoch, & Goozée, 2001). Furthermore, 50–89% of individuals with Parkinson's disease (Hartelius & Svensson, 1994) and the majority of individuals with motor neurone disease (Saunders, Walsh, & Smith, 1981) will exhibit significant dysarthria with disease progression. With consideration to the ageing populations evidenced in developed nations, the number of cases of dysarthria seen by speech pathologists will only increase.

Dysarthria is characterised by deficits to the speed, strength, range, timing or accuracy of the speech movements. It may affect one or more of the motor speech subsystems including: respiration, phonation, articulation, prosody, and resonance. The resultant speech disorder is characterised by deficits in both the segmental (e.g., phoneme distortions, substitutions) and suprasegmental (e.g., monotone, monopitch) features of speech production. Across all dysarthria types, speech intelligibility is affected to some degree. It ranges in severity from mild, with increased attention required by the listener to understand speech, through to profound disorder and unintelligible speech.



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review will focus on the application of speech processing literature and theory to the clinical domain of dysarthria.

Dysarthria and theoretical models of speech perception

Research has identified several cognitive perceptual processes essential to the comprehension of a connected speech signal. These include: lexical segmentation, lexical competition, and lexical activation. In brief, these perceptual processes enable the listener to segment a continuous speech stream into individual words, to access the lexical items that may match these targets, and finally to select the most appropriate word for the spoken utterance. Word meanings are then accessed, and comprehension of the utterance occurs in context. Liss (2007) hypothesised that the segmental and suprasegmental deficits exhibited by speakers with dysarthria may result in interference with the fundamental speech perception processes of lexical segmentation, competition, and activation. Impaired comprehension of message targets (or reduced intelligibility) is the resultant outcome.

Support for this theoretical position was demonstrated by Liss, Spitzer, Caviness, Adler, and Edwards (1998) in their study of 70 young healthy listeners' transcription responses to the speech of individuals with Parkinson's disease (PD) and moderate hypokinetic dysarthria. Liss et al. reported that the suprasegmental deficit of reduced syllable strength (i.e., monopitch and monoloudness) exhibited by individuals with hypokinetic dysarthria had a negative effect on the listener's ability to successfully undertake lexical segmentation, a process thought to be strongly reliant upon the alternating strong-weak syllabic pattern of English (see Cutler & Norris, 1988). As a result, the listeners' ability to comprehend the disordered speech signal was compromised. In a follow-up study that compared listeners' responses ($n = 60$) to hypokinetic and ataxic dysarthric speech of moderate severity (Liss, Spitzer, Caviness, Adler, & Edwards, 2000), it was demonstrated that listeners exhibited even greater difficulty employing their use of syllable stress patterning for successful lexical segmentation during perception of ataxic dysarthric speech.

Overall, the findings indicate that salient deviant features of dysarthric speech may differentially affect listeners' ability to employ their perceptual processes during attempts to decipher a spoken message. The insightful nature of these results highlights the need for further research in this field. Further to the work of Liss and colleagues (1998, 2000), it is possible that research investigating speaker-listener interaction, within a framework of speech perception theory, may uncover promising new approaches to the assessment and treatment of dysarthria. Conceptually, we propose three primary areas in which further research may inform the development of assessment and treatment plans for dysarthria. These are discussed in turn below.

Behavioural intervention techniques and speech perception theory

In general, behavioural intervention techniques are undertaken with the intention of enhancing the quality of the speech signal and, in turn, improving the ability of the listener to comprehend the speaker's intended message. Intervention techniques take a variety of forms, though three primary strategies appear commonly in the clinical literature: increased vocal loudness, reduced speech rate, and modifying intonation (stress) patterns. To date, research

investigating the success or otherwise of these techniques has focused primarily upon speech production changes. For example, Ramig and colleagues (2001) demonstrated, using the Lee Silverman Voice Treatment program, that the use of increased loudness as a facilitative strategy in PD resulted in significant increases in vocal loudness (in decibels) during sustained phonation, reading, and monologue. While speaker-based dependent variables are important clinical outcomes measures, it could be argued that for speakers with reduced intelligibility, the ultimate outcome of treatment success is an improvement in the listener's ability to understand the speaker. Thus far, only a limited number of studies have examined how these intervention techniques result in concurrent changes to listener ratings of intelligibility (see Wenke, Theodoros, & Cornwell, 2008).

To our knowledge only one study has explicitly examined the effect of commonly used treatment strategies upon listener ratings of intelligibility. Tjaden and Wilding (2004) recorded 27 individuals with dysarthria associated with PD and multiple sclerosis (MS) under conditions of "habitual", "loud", and "slow" speech. Ten naive listeners rated intelligibility using a direct magnitude estimation³ paradigm. Results of the study indicated that for speakers with MS, intelligibility was highest in the habitual condition. In contrast, the group with PD exhibited higher intelligibility in the loud condition relative to the slow and habitual conditions.

The findings of Tjaden and Wilding (2004) highlight the possibility that behavioural treatment strategies may differentially affect listener processing. However, this area remains unexplored. It is clearly of interest to determine whether segmental or suprasegmental changes in speech production, resulting from traditional intervention techniques, facilitate or inhibit listeners' ability to apply typical perceptual processing rules to understand the spoken message (Liss, 2007). For example, why does increased loudness appear to facilitate listener comprehension of speech associated with PD? Also, how do other commonly used strategies affect speech comprehension? With converging evidence from production and perception, the theoretical bases for the selection of treatment targets would be strengthened.

While research in this area is forthcoming, clinically, awareness of the potential effects of specific intervention techniques upon communication partners' perceptual processing strategies is important. When choosing intervention techniques, consideration could be given to determine which types of strategies facilitate improved comprehension on behalf of the speakers' primary communication partners. This could be trialled during treatment sessions as a form of "stimulability" testing. Furthermore, perceptual processing deficits of communication partners (e.g., resulting from hearing loss, memory problems, central auditory processing deficits) may also be considered in the development of treatment plans.

The communication environment and speech perception

For the majority of clients, speech intervention focuses concurrently upon learning and implementing behavioural strategies (i.e., improving intelligibility) and optimising communication effectiveness (i.e., improving comprehensibility). If communication effectiveness is the intended goal of treatment, cueing strategies and environmental modifications are employed with the aim of improving communication in everyday settings (Hustad, 1999). When implementing such strategies, two questions may arise: 1) how does the individual with dysarthria modify their speech when confronted with difficult communication

environments and 2) how do everyday communication environments affect listeners perceptual processing of dysarthric speech? Clinically, these questions are of paramount importance when consideration is given to the difference between the quiet clinical environment and the noisy, distracting everyday environments in which much communication between speaker and listener occurs.

Research has shown that noise adversely affects speech intelligibility, for normal speakers, under various listening conditions (Bronkhorst & Plomp, 1992; Danhauer & Leppler, 1979; Van Engen & Bradlow, 2007). Furthermore, increased cognitive effort is required by listeners when speech processing occurs in noisy conditions (Larsby, Hallgren, Lyxell, & Arlinger, 2005) and semantic, linguistic and prosodic knowledge must be recruited to atone for what can no longer be perceived within the signal (Pichora-Fuller, 2003). For older adults, which dysarthria affects most often, the challenges posed by everyday communication environments are even greater. While primarily due to peripheral hearing mechanism decline, central auditory processing abilities and cognition also appear to play significant roles (see CHABA, 1988).

Research is yet to determine if, or how, listener processing of normal and dysarthric speech differs in everyday listening environments. However, preliminary research has suggested differences may exist (McAuliffe, Good, O'Beirne, & LaPointe, 2008). While further research is required, steps can be undertaken clinically to consider the communication environment. First, observation of clients communicating in their everyday settings will provide an indication of general communicative effectiveness. Rating scales such as the Communicative Effectiveness Survey (see Hustad, 1999) may be completed to determine which communication strategies may provide the greatest benefit. Second, distracters within the communication environment can be identified and potentially minimised. Finally, observation of the communication environment will provide a clear indication of which behavioural treatment strategies may be of use to individual clients and their communication partners.

Perceptual learning and dysarthria

The term 'perceptual learning' is used to describe the effect whereby exposure to a specific signal alters a listener's perceptual processes during subsequent encounters with that signal. Research has demonstrated that a listener's perception of speech that is initially difficult to understand can improve significantly with exposure to the signal (Norris, McQueen, & Cutler, 2003). For example, when a listener first encounters a speaker with an unfamiliar foreign accent, they may find it difficult to understand. However, with repeated conversations with that speaker (i.e., exposure), the listener can become better able to comprehend the speech.

It has been proposed that perceptual learning effects may be one avenue to explore in the development of new intervention techniques in dysarthria (Liss, 2007). Such intervention would aim to improve a listener's ability to comprehend a neurologically disordered speech signal. This listener-targeted treatment would not replace traditional behavioural intervention; rather, would serve as an adjunct to speaker-oriented programs. In cases where the speech signal is so severely impaired that direct speaker-based intervention would be of little benefit (e.g., motor neurone disease), interventions targeting the listener may provide a new method of improving communication interaction. This could be particularly relevant for those individuals who exhibit co-occurring physical, cognitive, and/or memory deficits, all of which may inhibit new learning, the generalisation of treatment techniques, and/or the use of speech devices.

Currently, the nature of perceptual learning effects is not well understood in dysarthria. Some studies have demonstrated a perceptual benefit with prior exposure to the dysarthric speech signal (e.g., D'Innocenzo, Tjaden, & Greenman, 2007; Liss et al., 2002), while others have failed to find a beneficial effect associated with prior exposure (e.g., Garcia & Cannito, 1996). Closer examination of these studies reveals significant methodological differences among the studies which, in addition to the limited number of studies conducted, may account for the conflicting results observed. A considerable body of literature exists in the wider field of perceptual learning. To date, these principles have not been applied or tested in the clinical domain of dysarthria. Research of this kind is required to provide a foundational basis for the potential development of listener-assisted or listener-based rehabilitation techniques.

Clinically, the potential effects of experience with the speech of an individual with dysarthria are of relevance when selecting outcome measures. If pre and post-treatment speech rating scales or intelligibility tests are undertaken by the assessing and treating therapist, the effects of perceptual learning will likely result in artificial inflation of post-treatment scores. Therefore, it is imperative that non-treating therapists undertake pre and post-treatment rating scales. Furthermore, additional outcome measures by familiar listeners (i.e., spouse, friends, etc.) may be useful to determine whether treatment effects noted by unfamiliar listeners (e.g., non-treating therapists) are similar to those of regular communication partners. Such measures will significantly improve the validity of outcome measures for the management of dysarthria.

Conclusions

Speech production impairments form an important component in the assessment and treatment of dysarthria. However, clinical practice and research is also beginning to consider dysarthria management from the standpoint of speech perception; that is, how and why a communication partner fails to comprehend what is said by the speaker. Further research based on theories of perceptual processing is required to strengthen the rationale for existing treatment techniques and may also provide avenues for the development of additional or alternative treatments in dysarthria.

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1. Whanau (pronounced "far-no") is a Maori word, used commonly in New Zealand, meaning immediate and extended family.
2. We recognise that a recent study has drawn distinctions between the terms "comprehension" and "intelligibility" (Hustad, 2008). For the purposes of this paper, the terms "comprehend" and "comprehension" are used to mean "decipher".
3. An intelligibility scaling procedure used commonly in motor speech disorders research.

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Clinical outcomes of simple behavioural treatments for adults who stutter

Three case studies

Stacey Sheedy, Mary Erian, Wendy Lloyd, and Margaret Webber

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THIS ARTICLE HAS BEEN PEER-REVIEWED



Stacey Sheedy

Published reports of treatments for adults who stutter have predominantly focused on prolonged speech or its variants. Yet community clinics are often unable to provide intensive treatment programs and further, clients may not require speech pattern modification. There have been comparatively few studies of simple behavioural treatments. These have generally been experimental and results are varied. This paper presents three retrospective case studies of simple behavioural treatments employed in a weekly format with adult and adolescent clients at the Stuttering Unit, Bankstown Health Service. Treatments were self-imposed time-out, prompts to reduce rate, and training to access existing fluency skills. The clients achieved desirable treatment outcomes in few clinical hours. Applicability for other services is discussed.

The most commonly employed treatment technique for stuttering in adults and adolescents is prolonged speech (PS) or a variant. These complex treatments require the client to be taught to restructure their speech pattern. Although they are effective, post-treatment speech is often unnatural sounding and clients need to consciously control their stutter. Alternatively, there are simple behavioural techniques that ameliorate stuttering without speech restructuring. There are limited publications relating to these treatments. Publications have mainly been experimental and results have varied. Little is known about outcomes applied in clinical settings.

Self-imposed time-out (SITO) is one such treatment. Surprisingly, there have been few studies of SITO (see James, 1981; James, Ricciardelli, Rogers, & Hunter, 1989; Hewat, O'Brian, Onslow, & Packman, 2001; MacMillan, 2003; Hewat, Onslow, Packman, & O'Brian, 2006), yet all have shown a treatment effect for at least some subjects. Onslow, Jones, O'Brian, Menzies, and Packman (2008) report that there have been replicated phase I trials of SITO as well as an unreplicated phase II trial. The basic procedure is for the client to stop talking for a short time contingent on stuttering. The duration of the time-out interval has been reported to be irrelevant to the effect (James, 1976).

However, it is necessary for it to be contingent on stutters (James, 1981).

Hewat et al. (2006) reviewed the literature and reported several advantages of time-out. These include that speakers can easily self-impose the stimulus thus aiding generalisation. In contrast to PS, time-out is applied for moments of stuttering rather than continuously as is the case for PS. Finally, time-out seems to be capable of reducing stuttering severity in fewer clinical hours than PS.

Another simple behavioural treatment is rate reduction (Ingham & Packman, 1977; Starkweather, 1990). "Slow down" is advice that most people who stutter will report they have been given, often by well-meaning relatives. Clinical experience indicates that it does not always work. However, Onslow (1993) states that rate control "may be effective for clients with mild stuttering which they wish to control in specific situations" and it is a treatment to explore if assessment shows that reduced rate controls the stutter (p. 103).

Yet another simple treatment approach is for the client to control stuttering by accessing their own existing fluency skills (James, 1981; Martin & Haroldson, 1982; Onslow, 1993). Occasionally, clients present for assessment and when prompted to control stuttering, are able to do so.

These simple treatments may be suitable for some clients. Laboratory studies have demonstrated that some adults responded well to simple behavioural treatments. Onslow and Packman (1997) state: "The sheer weight of the findings on PS has tended to divert attention from the potential benefits of operant methods in treating adult stuttering" but "empirical support is lacking" (p. 369).

There are some advantages to treating adults who stutter with simple behavioural treatment (Onslow, 1993, p. 122). Treatment is self-administered during everyday speaking situations so generalisation is part of the treatment effect. Treatment does not result in unnatural-sounding speech and the effectiveness of treatment is apparent in less time.

The Bankstown Stuttering Unit's policy is to be guided by the evidence in the literature as well as to assess each client's ability to control their stutter using simple treatments first and clinicians at the Stuttering Unit are mindful that some adults and adolescents may respond to simple behavioural treatments and trial these if indicated. Trials are of a short duration, typically several minutes, so minimal time is needed to determine whether clients are suitable candidates. In some cases it is an efficient use of clinician and client resources to offer simple treatments.

It is imperative to identify those clients who are likely to respond to simple behavioural treatments. Onslow (1993) stated that adults typically have advanced stuttering which is less responsive to intervention, less variable without remission, and does not recover without treatment. However, certain client characteristics may indicate the use of simple behavioural treatments. These include that a trial results in a reduction of stuttering, the client has mild stuttering and/or occasions when speech is stutter-free, or as Hewat et al. (2006) conclude, the client has had previous speech restructuring treatment. Treatment choices are based on evidence in the literature as described. However, clinical skill is required to select the best treatment option for each client. This is done on a case-by-case basis in consultation with the client.

Case studies

Three retrospective adult/adolescent clients were treated with simple behavioural treatments at the Stuttering Unit, Bankstown Health Service. The treatments were self-imposed time-out, prompts to reduce rate and training to access existing fluency techniques. Treatment was conducted as part of a routine clinical caseload in a one-hour weekly format.

Characteristics of clients

Client characteristics are summarised in table 1. For all clients, case history factors were identified at assessment which indicated that the stutterer might respond to simple behavioural therapy.

Outcome measures

Treatment outcomes are described using clinician and client speech measures, collected within-clinic and beyond-clinic. These measures are percentage of syllables stuttered (%SS) and severity ratings (SR). The SRs are based on a scale 1–10 (1 = no stuttering, 10 = extremely severe stuttering). SRs have been shown to be a reliable measure of stuttering (O'Brian, Packman & Onslow, 2004). Clinicians collected %SS at most clinic visits and during some beyond-clinic telephone calls. Clients rated their stuttering severity daily beyond-clinic using the severity rating scale. The reliability of these measures was monitored in the weekly clinic visits by comparing them with the clinician's ratings.

The goal of treatment for the three clients was to reduce stuttering to a sustainable level. Goals were negotiated with each client and regularly reviewed to ensure they were optimal and achievable. As is common clinical practice, clinicians problem-solved any treatment issues that arose. When they had attained consistent speech measures that met their specified speech targets and had showed stability,

clients completed performance-contingent maintenance based on that described by Harrison, Onslow, Andrews, Packman, and Webber (1998). That is, they attended clinic visits with increasing time intervals between them when they met the speech criteria. If they did not meet speech targets at any visit, progress through maintenance was halted until they did.

The treatments

Treatment 1. Self-imposed time out (SITO)

Two cases using SITO as the primary treatment technique are outlined. SITO was implemented in a non-programmed format. The first client (C1) also incorporated the strategy of accessing his own existing fluency techniques as he was prompted to "try not to stutter". The second client (C2) was exposed to elements of PS to elicit further progress when he had plateaued.

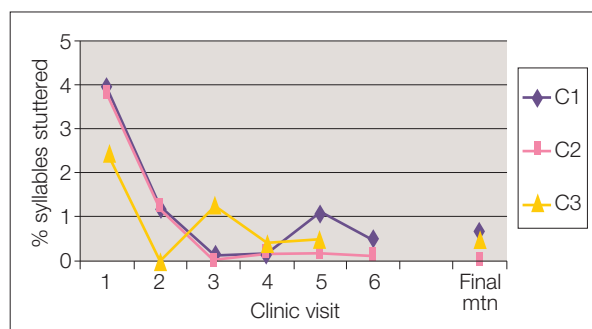


Figure 1. Within-clinic measures for C1, C2 and C3

Client 1 (C1)

C1 was frustrated with his stutter. He had stuttered since he was young but had not had therapy as an adult. He stuttered most on the telephone, when talking to business people, and when speaking with his father. At assessment, a severe stutter was evident (see table 1). He presented with SR 8, but this was reported as his most severe stuttering. Typically his SRs were reported to be 2–3 although he had periods most days when stuttering severity increased.

During therapy trials at assessment when C1 was instructed to "try not to stutter" his SRs reduced from 8–9 to 3. When SITO was trialed in conversation by instructing C1 to stop talking for several seconds when or before he stuttered, he stopped stuttering. During those trials C1 reported that he was "speaking properly" and talking with "slow and pronounced speech" to control his stutter.

C1's initial therapy visit was one month later. His speech was rated at SR 7 and 3.9%SS within the clinic. Stutters consisted of audible inspirations and multiple repetitions.

Table 1: Client characteristics

Client	Age at initial therapy visit	Language/s	Severity at assessment	Types of stutters	Previous therapy?
C1	39	English	SR 8. Reported representative of worst rating; typically much lower	Multiple repeated movements with tension and deep breaths with raised shoulders	During primary school; no therapy as an adult
C2	15	English, Serbian	3.8%SS, SR 4. Typical SR 3 reported	Repeated movements, fixed postures with and without audible air emission and verbal superfluous behaviors	No
C3	29	English, Chinese, Vietnamese	1.8%SS, SR 3. Reported SR 4–5 at worst	Initial syllable repeated movements and some fixed postures without audible air emission	No

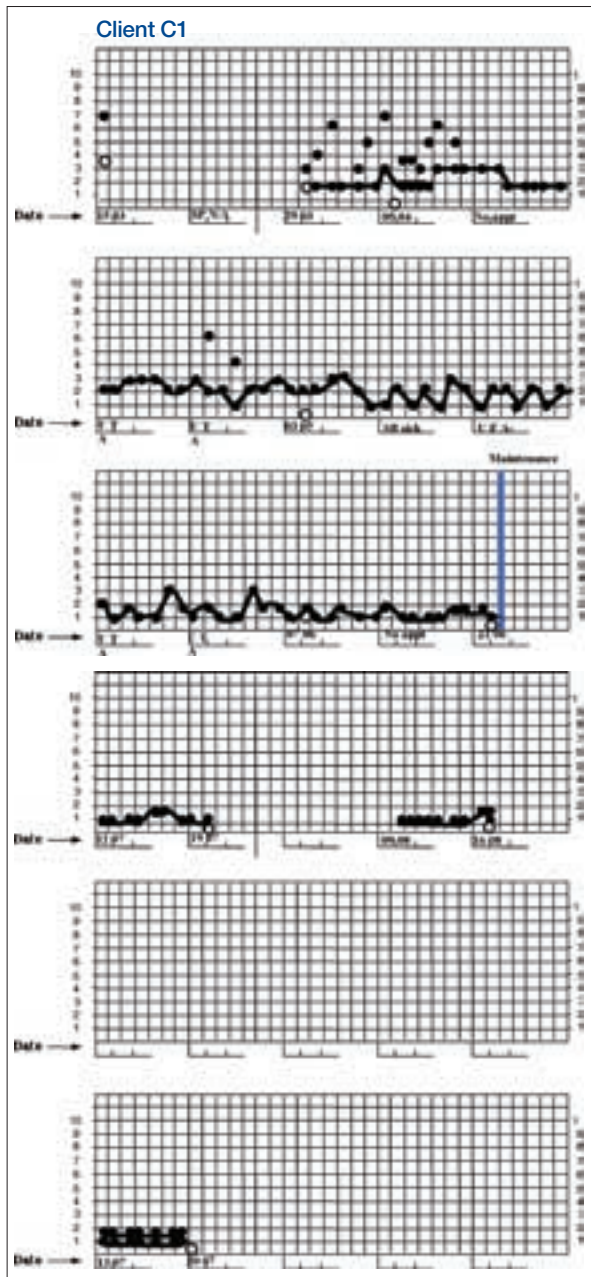


Figure 2. C1's severity rating chart (Key: o = % within-clinic SS, ● = beyond-clinic SR)

During this visit C1 was again instructed to control his stutter the best he could. It reduced to 0.2%SS but C1 stated that although stuttering severity reduced with that strategy his speech felt unnatural. SITO was introduced despite his low severity in the clinic and SR 1 was maintained during conversation. The treatment was implemented in a non-programmed format during conversational speech. The period of time that C1 stopped talking when he stuttered became quite brief so his speech was relatively natural. Although it was unclear whether C1 was using elements of self-control and SITO or just SITO to control his stutter, C1 was advised to practise SITO daily with his wife or sister for 15 minutes and to apply SITO to everyday conversations with the goal of reducing the severity of his stutter to a sustainable level. He reported that he did not always practise SITO in set-up times, but consistently practised using the technique of SITO in real conversations. He collected daily SRs which were used to monitor progress.

C1's severity had reduced by the next clinic visit and gradually improved over several weeks within-clinic (see

figure 1) and beyond-clinic (see figure 2). During his fifth clinic visit, C1 stated that his severity overall had improved and he had minimal stuttering but that he was using SITO and "slow deliberate" speech for conversations when he thought he would stutter, and this resulted in SRs of 1–2 all of the time. He attended 6 clinic visits over 14 weeks. These were scheduled weekly but several visits were missed. At his final therapy visit, his stuttering was rated at 0.5%SS and SR 2. His beyond clinic SRs were 1–2. C1 stated that he was comfortable with his speech strategies and felt able to sustain his low stuttering severity. Following his treatment sessions, C1 completed performance-contingent maintenance over a period of 12 months. At the final visit, within clinic speech measures were 0.7%SS and SR 2. His beyond clinic SRs continued to be 1–2.

Client 2 (C2)

C2 was a school student in year 10 when he presented for therapy. He reported delayed developmental milestones and late onset of stuttering at 11–12 years of age. His stuttering was initially reportedly characterised by frequent, easy repeated movements. However, at assessment C2 displayed fixed postures without audible air emission with tension in his chest and word-avoidance. He stated that he stuttered most when excited or anxious and avoided some situations (e.g., ordering food). C2 had developed a strategy to control his stutter. He "stopped and waited a while, then started again". This apparently helped control his stutter.

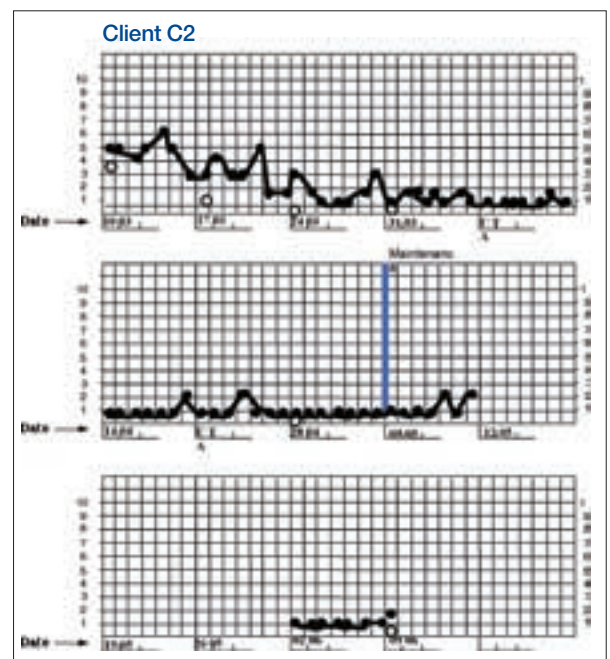


Figure 3. C2's severity rating chart (Key: o = % within-clinic SS, ● = beyond-clinic SR)

At assessment, a significant stutter was evident (3.8%SS and SR 4). Typical SR was reported to be 3 (see table 1).

At C2's initial treatment appointment 6 months later, his speech was measured at SR 5 and 3.8%SS within the clinic. His stutters were characterised by repeated movements, fixed postures with and without audible airflow. Clinician-imposed time-out was trialled and C2 spontaneously used SITO in conversation. With time-out set for five seconds, C2 was able to produce lengthy stutter-free sentences. His treatment was implemented in a non-programmed format. He was advised to practise daily with his mother/father for 10 minutes or 2 x 5 minutes. Daily severity ratings were recorded by C2 to monitor his progress beyond the clinic.

C2's stuttering severity reduced within the first week of treatment and gradually improved over several weeks within-clinic (see figure 1) and beyond-clinic (see figure 3). C2 was taught soft contacts and gentle onsets (components of PS treatment) for certain sounds in visit 4 as he reported difficulties restarting on particular sounds. He was advised to use these if needed to control his stutter, but PS elements were not prompted for again during his treatment.

C2 attended 6 clinic visits over eight weeks. At his final therapy visit, measures were 0.1%SS and SR 1. Beyond the clinic SRs were all 1s for the week preceding the visit. Performance-contingent maintenance was completed over 15 months. At his final maintenance visit, measures were 0%SS and SR 1. C2 reported severity ratings beyond the clinic of 1–2, but mainly 1s.

As shown by these two case studies, SITO was an effective treatment. However, C1 used elements of self-control after having been prompted to “try not to stutter” and C2 was exposed to some elements of prolonged speech in one clinic visit. It is not clear how much these additional strategies contributed to the outcomes.

Treatment 2. Prompting to “slow down”

The following clinical example is a client who was treated with a prompt to “slow down”.

Client 3 (C3)

C3's stuttering severity had varied since onset and was at its worst when he was a teenager. At the time of his initial clinic visit, C3 stated that stuttering severity increased when he felt anxious. He also reported avoiding interacting in some social situations due to his stutter. He reported controlling his stutter by breathing slowly, avoiding words, and “taking his time”.

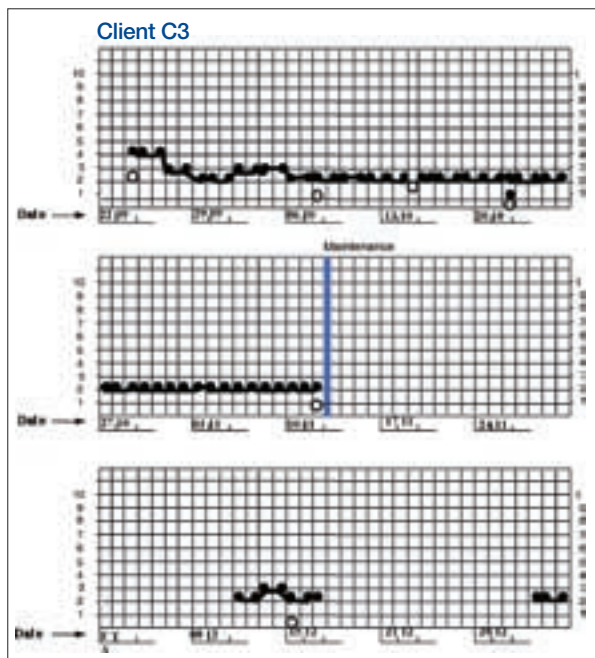


Figure 4. C3's severity rating chart (Key: o = % within-clinic SS, ● = beyond-clinic SR)

At assessment, baseline measures were 1.8%SS and SR 3. This was apparently typical, but his severity could increase to SR 4–5. C3 stated that he had 2–3 second fixed postures without audible air emission about once per fortnight. His goals were to reduce his stuttering severity and to reduce his rate, as C3 was concerned that he was sometimes unintelligible as a result of talking quickly.

C3 waited 3 months for treatment. At his first appointment, he was able to reduce stuttering severity from 2.5%SS (SR 3) to 1.7%SS with an instruction to “try not to stutter”. When prompted to “slow down” severity decreased further to 1%SS. Additional prompting to “slow down” resulted in a further reduction in severity (0.3%SS). Initially, C3 was advised to use this strategy of thinking about slowing down in one situation per day. He collected daily SRs which were used to monitor progress. For the next three weeks he practised 10–15 minutes daily with his girlfriend. After that he applied the strategy to actual conversations.

Severity reduced by the second clinic visit and gradually improved over four weeks within-clinic (see figure 1) and beyond-clinic (see figure 4). Speech rate reduced initially but was not assessed regularly so it is unclear whether C3 actually slowed down to control his stutter. Despite this, the instruction for him to “slow down” was sufficient for him to become more fluent.

C3 attended 5 clinic visits over seven weeks. At the final therapy visit, measures were 0.5%SS and SR 2. Beyond-clinic SRs were 2s, representing occasional single part-word repeated movements that were difficult to detect. C3's speech fluency was stable and he stated that he was pleased with his treatment outcome. C3 completed performance-contingent maintenance over 10 months. At the final maintenance visit measures were 0.5%SS and SR 2. Reported severity ratings beyond clinic were 2s with no fixed postures. As shown by this case study, a prompt to “slow down” was an effective treatment for this adult.

Discussion

Behavioural treatments are a clinical option worthwhile considering. All clients achieved their goals with efficient use of clinician and client resources. Clients were not required to use an unnatural speech pattern. Speech naturalness is usually measured with complex treatments and resulting speech can sound unnatural (Onslow, 1993). Anecdotally, treating clinicians have reported that the clients in this paper did not have unnatural-sounding speech although this was not formally assessed.

Clients completed the weekly phase of treatment in 6, 6 and 5 visits respectively. This is less than the minimum number of hours required to complete the instatement phase in any of the documented intensive programs which is 20.1 hours for the Camperdown Program (O'Brian, Onslow, Cream, & Packman, 2003) and 24 hours for Harrison et al.'s (1998) one-day intensive. All clients successfully completed a lengthy maintenance program (12, 15 and 10 months respectively).

These case studies highlight that it is possible and appropriate to treat some adults with simple behavioural treatments. Although it is not known how many adolescent or adult clients will respond, such treatments can be effective and efficient. Using the evidence both in the literature and from case history, treatment for each client was selected using the simplest treatment that was effective and suitable. A simple prompt not to stutter was trialled, followed by either prompts to “slow down” or SITO depending on case history. With measurements used to monitor progress speech pathologists implemented simple behavioural treatment and monitored its impact on the stuttering of clients.

Simple behavioural treatment is not suitable for clients who are unable to gain control of their stutter without direct speech restructuring. However, further research is warranted as there are clients who respond to simple behavioural treatments. Although these case studies had

promising outcomes, they are retrospective and longer term outcomes are unknown. Therefore generalisation of findings is limited. However, they highlight that when appropriate, it is worthwhile considering the viability of simple behavioural treatments with clients before attempting complex speech restructuring. Simple behavioural treatments have several advantages over PS. They are self-administered during everyday speaking situations so generalisation is part of the treatment effect. Treatment does not result in unnatural-sounding speech and the effectiveness of treatment is apparent in less time (Onslow, 1993). In addition, simple behavioural treatments can be easily applied in most clinics by speech pathologists. Speech pathologists can draw on their existing skills and offer suitable clients effective, simple, behavioural treatments.

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Weekly prolonged speech treatment for adults

Wendy Lloyd, Margaret Webber, Mary Erian, and Stacey Sheedy

The positive outcomes of various intensive prolonged speech (PS) treatments in groups are well documented in the literature. However, these models of service delivery for adults who stutter may be less viable in generalist clinics due to clinician and group requirements. Non-intensive PS treatment has been researched, but outcome data are lacking. This paper presents clinical outcomes which were obtained from a retrospective file audit of five clients. Each client's goals were achieved using PS treatment which was delivered during one-hour weekly clinic visits. Treatment was conducted as part of a routine clinical caseload at the Stuttering Unit, Bankstown Health Service. The viability of this service delivery model for some adults who stutter is discussed.

The outcomes of PS treatments delivered in various intensive group formats are well documented (Onslow, 1996; Harrison, Onslow, Andrews, Packman, & Webber, 1998; O'Brian, Onslow, Cream, & Packman, 2003; Block, Onslow, Packman, Gray, & Dacakis, 2005). Some of these intensive formats are characterised by multi-week or week-long instatement phases. More recently developed PS treatment programs (Harrison et al., 1998; O'Brian et al., 2003) include a much shorter intensive component of only one day. However, these programs still require a group of clients to be able to participate in treatment concurrently, as well as a minimum of two clinicians to be available for a full day for the intensive component. This type of service delivery may be difficult to provide in generalist clinics, due to the availability of clinicians and clients.

Onslow and Packman (1997) have suggested that prolonged speech treatment could potentially be delivered in non-intensive formats, but acknowledged that there is "little documentation to assist clinicians in formulating those creative variations" (p. 358). James, Ricciardelli, Hunter, and Rogers (1989) compared the outcomes of 20 adult and adolescent participants who received PS treatment in an intensive format to those who received treatment in a non-intensive format (2 x two-hour sessions per week). They reported that "at no stage, during or after treatment, did either treatment format produce superior results on

any of the measures, including stuttering frequency, rate of speaking, treatment efficiency, treatment compliance, and communication attitudes" (p. 392). This research suggests that for some clients, treatment in a non-intensive format will not be detrimental to treatment outcomes.

In addition, the intensive formats described by Harrison et al. (1998) and O'Brian et al. (2003) include a number of weekly sessions both pre and post the intensive day. O'Brian, Packman, and Onslow (2008) and Carey, O'Brian, Onslow, Block, and Jones (2009) have replaced the group intensive component with home practice in their respective telehealth studies of the Camperdown Program with no detriment to treatment outcomes.

Clinicians need further information to know whether PS treatment can be delivered in a non-intensive format and what outcomes can be expected. This paper presents five retrospective case studies of clients who were treated using a one-hour weekly prolonged speech service delivery model.

Treatment outline

This one-hour weekly PS treatment was adapted from the intensive formats of PS and in reference to Onslow and Packman (1997). Adaptations were made with particular consideration of those formats which included a reduced intensive component, a number of weekly visits, transference of PS in everyday life, and a maintenance phase. While a number of the intensive programs include programmed instruction, this weekly PS treatment was non-programmed. There is some support to suggest that programmed instruction is not necessary for some clients who learn PS (O'Brian et al., 2003; Packman, Onslow, & van Doorn, 1994).

Clients attended weekly 1-hour clinic visits. Beyond- and within-clinic speech measures were routinely collected by the clinician and client throughout the course of treatment and were used to evaluate progress. These measures included:

- percentage of syllables stuttered (%SS)
- severity ratings (SR) (1 = no stuttering, 10 = extremely severe stuttering)
- naturalness ratings (1 = very natural speech, 9 = extremely unnatural speech)

The %SS measures were gathered within the clinic by the clinician. The SR and naturalness scales were used as a tool by both the clinician and client to describe within- and beyond-clinic stuttering severity and speech naturalness.

During the course of treatment each client:

- established goals for treatment;
- learnt how to assign and use severity and naturalness ratings;

KEYWORDS

ADULT

NON-INTENSIVE

PROLONGED
SPEECH

STUTTERING
TREATMENT

THIS ARTICLE
HAS BEEN
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- learnt PS at varying naturalness levels, typically:
 - naturalness 9 was initially taught followed by naturalness 6, 3, and 2;
 - each naturalness level was initially taught after a clinician model;
 - naturalness levels were taught using word lists (1–5 syllable length), reading, monologues, and then conversation.
- practised varying naturalness levels within and beyond the clinic.
- established a hierarchy of easy to difficult situations to assist in setting short and long term goals and generalising use of PS into daily situations; clients were advised to use PS in everyday conversations as soon as possible;
- participated in problem-solving typically about issues of measurement, PS technique, home practice, goals, or applying PS in daily situations;
- participated in regular home practice; often tape recordings of word lists/monologues were used to aid practice;
- participated in a performance contingent maintenance phase (Harrison et al., 1998); maintenance criteria were set individually based on when clients achieved stable speech measures.

Client characteristics

The five clients reflected a range of ages, languages spoken, and stuttering severity as summarised in table 1.

Client	Gender	Age *	Language spoken	Measures beginning of treatment	Previous speech therapy?
C1	Male	20	English, Serbian	WC: 2.4%SS; SR 3. BC: SR 4–5	No
C2	Female	25	English	WC: 6.9%SS; SR 6. BC: SR 6–8	Approximately 2 years from 1996
C3	Male	25	Gujarati, Hindi, English	WC: 26.4%SS; SR 9. BC: SR 8–9	No
C4	Male	36	Cantonese, English	WC: 24.6%SS; SR 9. BC: SR 7–9	2-week intensive program early 1990s
C5	Male	69	English	WC: 0.6%SS; SR 2. BC: SR 3–8	Weekly smooth speech therapy 1975 & 1988

* At initial therapy appointment WC = within clinic; BC = beyond clinic; SR = severity rating

Treatment implementation

PS was chosen as the treatment of choice at the first clinic visit for four clients (C2, C3, C4, and C5). At first C1 responded to self-imposed time-out (SITO) (James, 1981). Despite an initial reduction in severity C1 continued to display small blocks and consequently PS was introduced at his fifth clinic visit.

Training of PS at various naturalness levels and incorporation of the technique into everyday conversations was tailored to each individual client. All clients were able to use PS at naturalness levels of 2–3 in monologue/conversation by visit 5–10. C5 only required soft contacts (an element of PS) as his treatment technique.

Tape recordings of clients using unnatural versions of PS for words lists and monologues in the clinic were used to aid practice in all cases and to check beyond clinic speech measures in two cases (C4 and C5). Three clients (C1, C3, and C4) were bilingual speakers. PS treatment was conducted in English. Only C3 needed specific practice of PS in his first language.

A description of individual client progression in learning and applying PS follows.

Client 1 (C1)

Due to initial trials of SITO C1 was taught PS in visit 5. Initially naturalness 9 was taught in 1-4 syllable words. In visit 6 C1 progressed to practising naturalness 4 in word lists, then in reading and monologue. Naturalness 3 was introduced in visit 8 and C1 was able to use this in monologue and conversation. Naturalness 2 was introduced in visit 10. At that point C1 was advised to start practising at naturalness 2 with family members where he aimed to achieve a SR of 1 or 2. Subsequently C1 began using naturalness 2 in specific conversations based on his hierarchy of speaking goals. In visit 13 C1 reported using naturalness 2 in most situations however practice continued to focus on more specific target situations. During the treatment phase, C1 reported practising every day. Tape recordings of monologues/conversations in home practice were used routinely to improve C1's self-monitoring and consistency in using PS.

C1 commenced maintenance after visit 25. His maintenance criteria were:

- beyond clinic (BC): SR 2 and occasional 3
- within clinic (WC): $\leq 1.5\%SS$ with $SR \leq 3$

C1 completed maintenance in 5 visits over an 8-month period. At his last visit, he reported using naturalness 2 on a "as needs basis" in order to maintain his severity goals.

Client 2 (C2)

At visit 1, C2 was taught naturalness 9 in 1 and 2 syllable words. Naturalness 9 was then taught in reading and by visit 4 C2 was producing naturalness 9 in monologue and naturalness 6 in 2–5 syllable words. By visit 7 C2 was using

naturalness 9, 6 and 3 in monologue. C2 used tape recordings of her practice at home to improve her ability to self-monitor her use of PS. Naturalness 2 was introduced in visit 8 and by visit 9 C2 was beginning to practise naturalness 3 or 2 with specific people. Following clinic visits involved some practice at more unnatural levels but focus was also on refining her use of naturalness 3 and 2. Problem solving regarding generalisation of PS continued.

C2 commenced the maintenance phase after visit 22.

Maintenance criteria was:

- BC: SRs of at least four 2s and three 3s
- WC: $\leq 2\%SS$ with $SR \leq 3$.

C2 completed maintenance in 6 visits over a 10-month period.

Client 3 (C3)

In C3's first visit he was taught naturalness 9 in one-syllable words. In his second visit naturalness 9 was taught in 1–3 syllable words. This was recorded onto a tape to aid home practice. In following visits PS was taught at naturalness 9 and 6 in word lists and then monologue. By visit 5 C3 was using naturalness 3 in monologue and at home was practising naturalness 9 and 6 alone and naturalness 3 or 4

in conversation. In visit 11 C3 reported trying to use naturalness 3 in all of his daily conversations. He continued to practise varying his naturalness levels in reading and specified practice conversations. Practice goals were also set for his first language, Hindi.

C3 commenced the maintenance phase after visit 15. Maintenance criteria were:

- BC: SRs < 3
- WC: $\leq 3\%SS$ with SR ≤ 3 .

In the seventh maintenance visit, C3 was reporting difficulties using PS for lengthy conversations and on the phone. As a result a decision was made to return to treatment. C3 attended three fortnightly visits and then re-entered maintenance with criteria set at:

- BC: SRs ≤ 4
- WC: SR ≤ 3 with $\%SS \leq 4$.

Nine more maintenance visits followed over a 16-month period.

Client 4 (C4)

Initially PS was taught at naturalness 9 in words and phrases. In visit 2 C4 was able to use naturalness 7–8 for short phrases in conversation. C4 was encouraged to choose a practice partner for his home practice and tape recordings were regularly used to aid practice. By visit 5 C4 was varying his naturalness from 6 to 2 in 30 second monologues and conversations. However, due to his severe stutter, in following sessions it was necessary to work at more unnatural levels in order for C4 to improve his consistency in using PS. C4 was advised to practise at home at naturalness levels 9, 6, and 3. In visit 10 he had an increase in stuttering severity and it was necessary to return to practising PS unnaturally in word lists. A few sessions were required before C4 could return to using PS in monologue at varied naturalness levels. By visit 14 C4 was beginning to use some naturalness 2 and 3 in practise alone and with his practice partner. The remainder of C4's sessions included practice at more unnatural levels but focused mainly on improving his use of naturalness 3 and problem solving around transferring his use of PS into daily situations.

C4 commenced the maintenance phase in visit 43.

Maintenance criteria consisted of:

- BC: average SRs ≤ 4 , worst rating ≤ 6 .
- WC: < 3%SS with SR ≤ 3 ; C4 was required to demonstrate that he could maintain naturalness 2–3 in monologue and five-minute conversation.

C4 completed maintenance in 9 visits over 19 months.

Client 5 (C5)

In his first visit C5 was able to demonstrate residual skills of his previous treatment, smooth speech (a variant of PS). The naturalness scale and concept of self-evaluation was introduced. In visit 2 soft contacts (an element of PS) was chosen as C5's treatment technique as he did not need all elements of PS to control his stuttering. Soft contacts were initially practised in word lists (particularly with plosive sounds) at naturalness 5 to 3. In visit 5, C5 was taught to use soft contacts in monologue at naturalness 2. Home practice consisted of practising soft contacts in word lists and then in conversation with practice partner. Tape recordings were utilised to provide models of soft contacts and also to collect %SS and SR measures for beyond clinic speech as this was reported to be higher than within clinic speech. Across time the beyond clinic measures of C5's speech decreased significantly (16.5%SS and SR 8 to 0%SS and SR 1).

C5 commenced the maintenance phase in visit 8.

Maintenance criteria was:

- BC: SRs of 1s and 2s
- WC: $\leq 1\%SS$ with $\leq SR 2$.

During the maintenance phase C5 practised once a week or if he noticed any increases in severity. C5 completed the maintenance phase in 7 visits over 6 months.

Client outcomes

All clients showed a significant drop in SRs and %SS scores at the completion of the weekly treatment phase. Within clinic %SS measures are represented in figure 1 and beyond clinic severity measures are represented in figure 2. Average weekly treatment time was 23 hours, with a range of 8 to 43. All clients used PS at a naturalness level where they could control stuttering. C1, C2, and C3 controlled their speech in most situations at naturalness 1–2 (as judged by clinician and client). C4 used naturalness 2–3 on a regular basis. No specific naturalness data was recorded in C5's final maintenance visit. However, the clinician reported that C5 was observed to use minimal soft contacts in his speech.

The clients' maintenance phase lasted for a period of 6–19 months during which time, four of the clients met

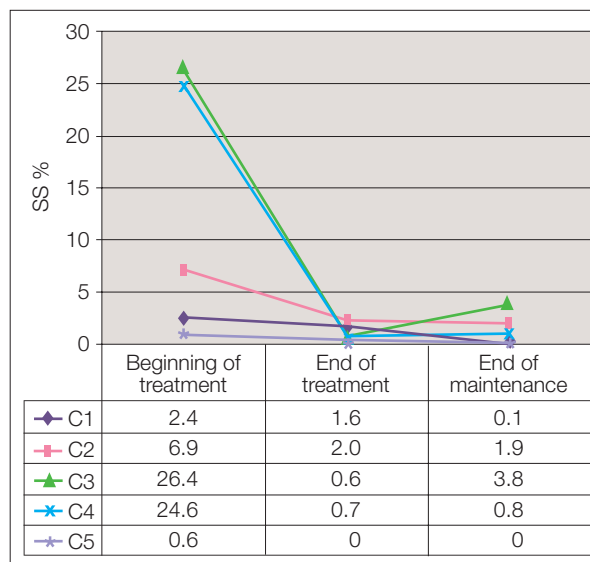


Figure 1. WC %SS for all clients

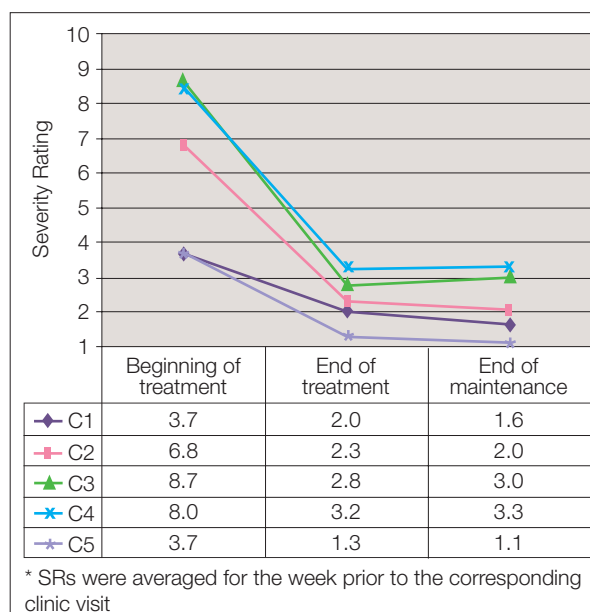


Figure 2. BC SRs*

or improved upon their negotiated criteria. C3 showed a marginal increase in SRs and %SS from those gained at the end of the weekly treatment phase. It is noteworthy that C5 did not require all elements of PS to control his stutter.

Discussion

Teaching PS in a one-hour weekly format was an effective service delivery model for these clients. Despite treatment visits being spaced a week apart, clients were able to learn the PS pattern, vary their naturalness levels and apply PS in everyday situations to reduce their stuttering severity, as evidenced by beyond clinic SRs. As previously stated, one client, C3, showed an increase in severity at the end of maintenance. This increase, however, still fell within the range of his maintenance criteria and was at levels that C3 reported being satisfied with.

In describing the outcomes of a One-Day Instatement Program for PS Harrison et al. (1998) reported that 24 treatment hours were required for clients to reach the maintenance phase. For the Camperdown Program outcomes, O'Brian et al. (2003) reported an average of 20.1 hours (range 13–29 hours) to reach the maintenance phase. Block et al. (2005) reported that 45 hours were required to complete the instatement and transfer phases of a 5-day intensive PS treatment. The treatment duration for the five clients presented in this paper was an average of 23 hours (range 8–43) and is comparable to these other publications.

For certain clients providing PS treatment on a weekly basis can be advantageous. Weekly treatment can be tailored to individual client needs particularly in regards to their goals, learning styles, and circumstances. This is of great consequence for clients who require an interpreter or have limited English competency. Additionally, some clients (e.g., C5) may not require all elements of PS to control their stutter so treatment can be flexible. Further, when clients are treated in a non-intensive weekly format, generalisation of PS is not likely to be adversely affected. Clients can ease into the use of PS during everyday life situations (Onslow & Packman, 1997). Finally, many speech pathology clinics would be able to implement this service delivery model. For example, weekly treatment is potentially more accessible to isolated or rural clinicians who may not have appropriate resources to provide a group intensive treatment format and smaller clinics who may not receive sufficient numbers of adult referrals in order to form a group.

There are disadvantages of weekly treatment. For some clients, treatment may take longer than reported in the more recent intensive format literature. It is difficult to determine whether clients treated individually are potentially "missing" valuable learning experiences that may take place in a group/intensive format. For example, being able to interact and practice with other people who stutter or being exposed to using PS for an extended period of time. Hearne et al. (2008) hypothesised that for adolescents, the group component of the intensive day of the Camperdown Program may be beneficial due to peer support. This may be relevant to adults. Lastly, more intensive practice of PS may be indicated if the client is not progressing in a weekly format.

The method described in this paper is one way of teaching PS. There are alternative methods described in the literature that clinicians might consider, in particular that described in the Camperdown Program (O'Brian et al., 2003; Carey et al., 2008). Clinicians need to consider the literature as well as clients' needs and responsiveness to various teaching methods when deciding how to implement treatment.

Outcomes for the reported clients have been gained retrospectively through a file audit and are therefore limited in generalisability. However, there is little outcome information in the literature on weekly PS treatment to guide clinicians. Hence, this paper provides some preliminary information indicating that for some adults who stutter, a one-hour weekly PS treatment program may be a viable option to consider.

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Voice therapy prepractice and the principles of motor learning

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Study of the principles of motor learning is an emerging area of scientific and clinical interest to speech pathology. To date, limited research has applied principles of motor learning to voice therapy and no research has addressed in detail the prepractice phase of voice therapy. This paper reviews the available literature on the prepractice phase of motor skill learning, largely based on sports and exercise science research. Five key prepractice components are identified: motivation, instruction, modelling, perceptual training, and feedback. Suggestions are made as to how these principles may be applied to voice therapy prepractice, providing clinicians with explicit guidelines for the initial stages of voice therapy intervention.

Direct voice therapy, which changes vocal technique to improve vocal function, has developed substantially over recent years (Speyer, 2008). Direct voice therapies aim to replace disordered vocal technique with vocal behaviours which are sustainable, functional, and efficient. Thus these therapies change the habitual motor skills associated with voice production.

The principles of motor learning (PML) are a schema to explain how performance and learning of motor skills is affected by variables such as type and distribution of practice and feedback (Wulf & Shea, 2002). Voice therapy involves learning of a new motor pattern, relearning previously efficient patterns, and eliminating mislearned patterns. As such, PML can and should be applied to voice therapy. The aim of this paper is to review the PML literature on the prepractice phase of therapy and to discuss how these principles might apply to voice therapy.

In PML based therapies (and others based on learning theory more generally), intervention can be divided into two phases: prepractice and practice. Prepractice is the phase where the client acquires a basic knowledge of what the task is and how to perform it through conscious and focused attention on the movement. Practice is the phase where the client improves their proficiency, accuracy and speed of performing the targeted skill such that the movement is “learnt” (maintained and generalised) and produced without conscious attention to its execution. While the

client is highly reliant on the clinician for cues and prompts in the prepractice phase, in practice the client develops independence and automaticity in production of the target movement. In the case of voice therapy, prepractice might involve demonstration, explicit instruction or initial attempts at a given movement while practice may be drill-like repetition of the new skill in an increasing hierarchy of tasks.

Motor learning research has predominantly focused on structuring practice and on feedback during the practice phase to ensure training leads to effective learning. This research has involved increasing task demands during practice to ensure that training leads to maintenance and generalisation of motor skills, rather than temporary improvements in performance during practice (Maas et al., 2008). However, significantly less research has addressed the initial phase of learning: the prepractice phase. This is despite the client needing to be able to at least approximate the target movement prior to beginning practice (Maas et al., 2008). Examination of the prepractice phase could provide clinicians with explicit guidelines for the initial stages of intervention, where clinician behaviour is most salient.

Prepractice components

The aim of prepractice is to prepare the client for the upcoming practice sequence, ensuring that the client has knowledge of the movement goal (internal reference-of-correctness) and can produce the movement under optimal conditions (Maas et al., 2008). The focus is on which factors allow a specified skill to be learned to a specified level of performance in less time, with less effort and/or with less cost (Wulf & Shea, 2002). This reduction is important for ensuring treatment efficiency. By looking at the general motor learning literature, it is possible to identify a number of potential key variables in the prepractice phase. These ideas are summarised in table 1.

Motivation

Acquiring a new motor skill requires effortful processing of information. Ensuring that the client is motivated is essential for maximising learning (Schmidt & Lee, 2005). Motivation may be established by conveying the importance of the task to the client (Maas et al., 2008) and by setting goals with the client (McNeil, 2009). Specific, absolute goals of moderate difficulty are beneficial to the performance and learning on motor tasks compared with “try your best” goals or compared with no goal (Kyllo & Landers, 1995; Weinberg, Bruya, Garland, & Jackson, 1990). Finally, clients should be actively involved in setting goals (McNeil, 2009). In voice

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Table 1. Principles of motor learning and voice therapy: the prepractice phase of therapy

	Example from the general motor learning literature	Hypothesised example
Motivation	Establishing importance of the task (Maas et al., 2008).	Education that vocal technique can improve vocal stamina, power and clarity.
Instruction	External attentional focus instructions (Wulf & Prinz, 2001).	Clinician provides instructions focused on effects of movement (voice clarity and sense of ease).
Modelling	Observation of learning-model more effective than expert model (Hodges & Franks, 2002).	Group voice therapy which allows clients to see others learning from a beginner phase.
Perceptual Training	Auditory training leads to motor learning in the absence of motor training (Meegan et al., 2000).	Auditory discrimination training of clear versus hoarse voice quality.
Feedback	Augmented knowledge of performance feedback (Swinnen, 1996).	Clinician provides information about pattern of voicing (e.g., hard glottal attack onset produced).

therapy, it may be appropriate to focus on the desired long-term change which results from learning a more effective vocal technique, that is, improved vocal stamina, power, and clarity. In planning such change, the client and clinician may together identify a functional goal that allows them to determine when therapy has been successful (Verdolini Abbott, 2008).

Instruction

The client must possess an understanding of the target movement in order to accurately produce the movement pattern (Hodges & Franks, 2002), suggesting that instructions and explanations about the movement goal may be necessary in the prepractice phase (Schmidt & Lee, 2005). However, the use of extensive instructions may reduce learning due to high cognitive demands interfering with effectively processing feedback or breaking from stable, undesirable behaviours (Hodges & Franks, 2001; Hodges & Lee, 1999; Wulf & Weigelt, 1997). Additionally, motor learning can occur without the client's explicit awareness of task rules and mechanical properties (Masters, 1992; Verdolini-Marston & Balota, 1994). Thus, simple holistic instructions focusing on the essential aspects of the actions are recommended to ensure that clients can achieve the movement goal in prepractice (Hodges & Franks, 2001; Schmidt & Lee, 2005). For more complex tasks, breaking the task into logical subunits may be appropriate where instructions initially focus on one or two essential aspects of the movement. Once they are achieved the client is instructed on the next most important aspects to attend to, and so on (Schmidt & Lee, 2005). Finally, instructions that direct attention to the effects of movements rather than the movement patterns themselves are most beneficial to learning the new movement (see Wulf & Prinz, 2001, for a review). By way of example, in tennis coaching one would focus on where the ball is intended to go rather than how to swing the racket. Consideration of these ideas suggests that instructions given during the prepractice phase of voice therapy should be short, simple, and focus on the sound of the voice (i.e., voice clarity) or on the sensations associated with successful production rather than contractions of laryngeal, respiratory, pharyngeal, or oral musculature.

Modelling

Modelling allows the client to observe aspects of the skill that cannot be verbally explained, and to observe and implement strategies that facilitate the learning of the target movement (Magill, 2007; McNeil, 2009; Ram, Riggs, Skaling, Landers, & McCullagh, 2007; Schmidt & Lee, 2005). Learners receiving multiple prepractice demonstrations start their own

practice at a higher skill level than those receiving a single prepractice demonstration (Weeks & Anderson, 2000). Additionally, provision of visual and verbal cues in combination with a visual model was found to increase accuracy and consistency of a discrete, complex motor movement (soccer kicking) at a faster rate than verbal instructions and demonstrations alone (Janelle et al, 2003).

Observation of other people as they learn or acquire a new motor skill is equally or more beneficial for effective learning than observation of experts demonstrating "correct" performance (Hebert & Landin, 1994; Hodges & Franks, 2002). This research suggests that clients are not merely copying movements but are engaged in a problem-solving process through vicarious learning. It follows that voice clinicians, who are by definition voice experts, cannot simply model a clear voice as a therapeutic device and expect a client to imitate it readily. Instead, clinicians may need to explicitly engage in activities that assist the client to problem-solve. This may be achieved by use of a step-wise approach whereby the clinician models successive, incremental changes to voice production and explain making these changes to their voice, for example, from hyperfunctional to easy and efficient voicing. One application to voice therapy of this research on learning-modelling is the adoption of group voice intervention, where clients can see each other learning (Simberg, Sala, Tuomainen, Selleman, & Ronnema, 2006).

Perceptual training

Perceptual training involves raising the client's awareness of sensations to develop understanding of the target movement. This may include auditory, kinaesthetic, visual, proprioceptive, or other sensory inputs alone or in combination. Perceptual training is most effective if it requires attention and some sort of response (Abernethy, Wood, & Parks, 1999; Schmidt & Lee, 2005). Such perceptual training may involve the clinician directing the client's attention to what they see, feel, hear, or otherwise sense during or after they attempt a new movement. In calling attention, the clinician may ask the client to attend to the sensation, remember the sensation, or contrast one sensation with another. An example of this from general speech pathology techniques might be the "Old way, New way" approach where the client is asked to compare the sensory outcome of two motor behaviours (Hanin, Korjus, Joust, & Baxter, 2002).

Auditory perception abilities play a vital role in developing an internal reference-of-correctness for both speech and voice therapy where the movement goal may be defined in an auditory way. Additionally, there is evidence that auditory

training can lead to motor learning in the absence of motor training (Meegan, Aslin, & Jacobs, 2000). Kinaesthetic perception is focal in some specific voice interventions. For example, Voicecraft™ emphasises sensations of tightness in the throat associated with laryngeal constriction (Bagnall, 1997) and Lessac Madsen Resonant Voice Therapy™ emphasises anterior oral vibrations associated with efficient voicing (Verdolini Abbott, 2008). In voice therapy, raising the client's awareness of auditory and kinaesthetic sensory feedback may be essential to assist them to use naturally available sensory feedback during the subsequent practice phase.

Feedback

As the aim of prepractice is to ensure the client is able to produce at least one correct movement (Maas et al., 2008), movement attempts are a key component of the prepractice phase. Feedback on the accuracy of these initial movement attempts is essential as a client needs to be aware that they are performing a movement incorrectly in order to attempt new, more accurate movements (Hodges & Franks, 2002). Following a movement attempt, the client has access to internally generated sensory feedback which may be augmented with feedback from the clinician or with instrumental biofeedback tools (Swinnen, 1996). Clinicians may provide feedback about the movement pattern (knowledge of performance) or about the movement outcome in relation to the goal (knowledge of results). The current literature is clear that knowledge of results type feedback ("did you get it right") is more effective in the practice phase of motor learning but the literature is less clear on which type of feedback is preferable in the prepractice phase. Analysis of the goals of the prepractice phase would suggest that knowledge of performance (how to make the movement) would be required at this stage of intervention (Maas et al., 2008).

Feedback may relate to auditory, kinaesthetic or visual aspects of the movement. It may be provided concurrently (during movement attempts) or terminally (immediately after movement attempts or following a delay) (Swinnen, 1996). Again the motor learning literature is relatively silent on this issue with regard to the prepractice phase. Yet, focusing on and raising awareness of auditory and kinaesthetic feedback, which are readily available during everyday interactions, may be a key component of the prepractice phase in voice motor learning (Boone, 2004).

Additional factors

The above prepractice components may vary with additional motor requirements, learner characteristics and with the characteristics of the instructor/speech pathologist, including their skills, knowledge, attitudes, beliefs, and motivation. Factors such as the complexity of the motor task, the capacity of the learner, and the interactions between instructor and learner will also influence which components are used in a particular prepractice event (Kwiatkowski & Shriberg, 1998; Magill, 2007). Clinicians should consider the task demands, environmental demands, and the motoric predisposition of the client when determining appropriate instructional approach to be provided to the client (Guadagnoli & Lee, 2004; Hodges & Franks, 2002).

Conclusion

Therapy using the PML includes both prepractice and practice components and while practice rules are well developed in the area of motor speech disorders, they are

not yet well developed in voice. In addition, in voice therapy programs, available through written description or workshop attendance, elements of the described prepractice components are present. These components are, however, not described in detail, and the efficacy of individual components of voice intervention has not been established either in the prepractice or practice phases of intervention.

The prepractice phase, while described generically is not set out prescriptively in the motor learning literature. Rather, the efficacy of the individual components has been proven without reference to each other. The current situation regarding the prepractice phase of motor learning is repeated across many aspects of learning theory and there is a strong need to examine what Embrey and Biglan (2008) call evidence based kernels. That is, research needs to be conducted to clearly establish which combinations, parameters, and intensities of prepractice components are essential to optimise motor learning. From this research we may be able to determine a set of evidence based practice guidelines for the prepractice phase of voice therapy.

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Workshop Presentation – Communication access to healthcare and life: Changing the culture of communication and inclusion

Dr Emma Hayiou-Thomas
Masterclass – Designing the perfect twin study: How to use behavioural genetics to tell us what we want to know about speech and language impairments
Keynote Presentation – The nature and nurture of speech and language development and impairment
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Assessing motor speech disorders using transcranial magnetic stimulation

Justine V. Goozée, Bruce E. Murdoch, David Lloyd, and Stephan Riek

This paper introduces a neurophysiological technique, called transcranial magnetic stimulation (TMS), which can be used to non-invasively stimulate the cortex. TMS provides a means of examining and modifying cortical function and the central motor pathways. Operating principles, types of analyses, and methodological considerations will be discussed, together with a review of TMS applications to the study and treatment of motor speech disorders to date, with a focus on tongue function.

Transcranial magnetic stimulation (TMS) provides a unique means of examining the excitability and integrity of the cortical regions and corticobulbar tracts controlling the speech musculature. In other words, it looks at how easily the cortical regions and pathways are activated and whether they are intact or damaged (see box 1 for a glossary). As such, it has the potential to improve our understanding of neurogenic disorders of speech, including dysarthria, apraxia, and stuttering. Although the technique has been utilised in neurological research for over 20 years, its application to the investigation and treatment of speech motor control and its disorders is only in its infancy. The purpose of the present paper is to provide an introduction to the technique, including how it works and the types of analyses that can be performed. Brief reviews of the limited speech motor control/disorder studies that have been conducted to date are provided and references for further reading are included.

Operating principles

TMS is now a common and widely accepted form of brain stimulation. It utilises Faraday's principle of electromagnetic induction and involves holding a flat wire coil against the head over the cortical region of interest (see figure 1). A brief, high-intensity current is passed through the coil, creating a transient magnetic field perpendicular to the plane of the coil. The magnetic field is able to pass unimpeded and relatively painlessly through the scalp and skull to the underlying cortex. This magnetic flux induces a small, localised electric current in the underlying cortical tissue and can depolarise (stimulate) the neurons in the immediate vicinity (George, Lisanby, & Sackeim, 1999; Kobayashi & Pascual-Leone,

Box 1. Glossary

Electromyography (EMG): Technique that records muscle activation

Excitability: How easily a brain region and neural pathway can be activated

MEP latency: Time from cortical stimulation to when the MEP occurs

Motor evoked potential (MEP): Muscle contraction elicited following stimulation of the motor cortex; recorded using EMG

Neuromodulation: Changing a brain region to make it more or less excitable

Transcranial magnetic stimulation: Non-invasive stimulation of the cortex by magnetic fields

2003). The magnetic field strength is typically about 2 Tesla (dependent on the TMS system used), which is similar to the strength of the magnetic field used in magnetic resonance imaging (MRI).

When TMS is delivered to the motor cortex, the neural pathways leading to various voluntary muscles can be activated and the resultant muscle contraction, known as a motor evoked potential (MEP), can be recorded using electromyography (EMG, see figure 1). Various measures, including the size of the MEP that varies with the level of cortical excitability, and the latency of the MEP (i.e., time from cortical stimulation to when the MEP occurs), which reveals the integrity of the cortico-bulbar/spinal pathways, can be taken. Two main types of TMS system are available: single pulse and repetitive. The main differences refer to the frequency with which the pulses are delivered and the resultant effects rendered on the brain (for further details, see Hallet, 2000). Single pulse TMS is considered to be safe and free of side-effects (George et al., 1999; Wassermann, 1998), whereas repetitive TMS has the potential to induce protracted changes in brain function. Adverse effects following the repetitive form of TMS are rare, but may potentially include seizures, effects on cognition and mood, transient auditory threshold shift, and headache (Wassermann, 1998). Safety guidelines for using TMS have been outlined in Wasserman (1998).

A range of measures detailing different aspects of cortical and corticobulbar tract integrity and function can be obtained by varying TMS stimulation and experimental

KEYWORDS

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SPEECH

TRANSCRANIAL
MAGNETIC
STIMULATION

TREATMENT

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Justine V.
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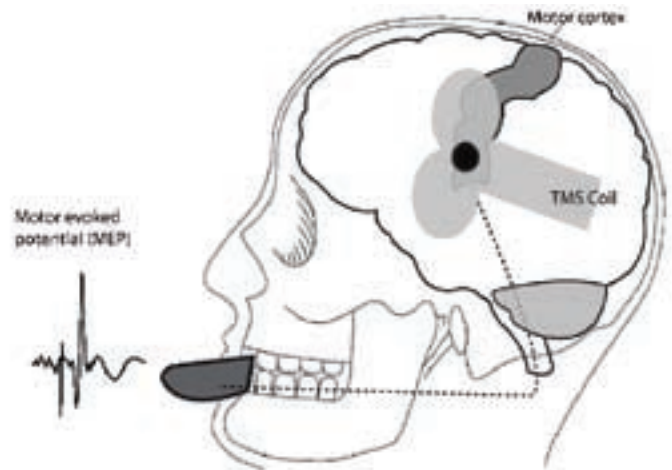


Figure 1. a) Photograph of a figure-of-eight TMS coil being held against the head over the motor cortex; b) Illustration of the TMS coil, activation of the corticohypoglossal pathway, and the resultant motor evoked potential (MEP) recorded in the tongue using electromyography (EMG)

parameters. TMS has been described as “a sensitive technique for investigating the corticobulbar tract, which is difficult to study by other methods” (Pouget, Trefouret, & Attarian, 2000, p. 182). It has an advantage over neuroimaging techniques in that it can directly interact with the brain and has a high degree of temporal precision. Neuroimaging techniques are based on measures of regional cerebral blood flow and glucose metabolism and, therefore, can only provide insights into the neural activity that is correlated with a given behaviour but can give no indication of whether the activity is excitatory or inhibitory in nature. Observational neuroimaging techniques also do not provide a means by which alterations in brain activity can be modulated like with TMS.

TMS analyses and parameters

The types of evaluations and functions that can be performed with TMS are introduced below, together with a review of how TMS has been applied in the study of speech and motor speech disorders to date, with a focus on tongue function.

Mapping cortical regions, function and plasticity

Single pulse TMS can be used to produce an anatomical map of the motor cortex by recording the sites over the scalp (and underlying cortex), which, when stimulated with TMS, activate the muscles of interest. By mapping the size of the stimulation sites at different time intervals, cortical plasticity associated with the learning of motor skills, disease progression, and/or recovery of function following injury can be examined (George et al., 1999; Pascual-Leone, Grafman, Cohen, Roth, & Hallett, 1997).

The site of the tongue motor cortex has been mapped (Rödel, Laskawi, & Markus, 2003) and plasticity of the tongue motor cortex region induced by tongue training tasks in healthy speakers has been investigated (Svensson, Romaniello, Arendt-Neilson, & Sessle, 2003), as have changes in corticobulbar pathway organisation and tongue cortical motor maps associated with disease (e.g., unilateral peripheral facial paralysis, Rödel, Tergau, Markus, & Laskawi, 2004) and recovery following stroke (Muellbacher, Artner, & Mamoli, 1999).

Evaluating the integrity of the corticobulbar pathways

Testing whether the corticobulbar pathways are intact or damaged can be achieved with single pulse TMS through

measures of the latency and size of the motor evoked response (MEP) in the muscle of interest. Prolonged latencies may be indicative of demyelination of the pathways, whereas reduced amplitude responses may be suggestive of a loss of neurons or axons (Kobayashi & Pascual-Leone, 2003). The corticohypoglossal pathways of healthy speakers and speakers with disorders including stroke, amyotrophic lateral sclerosis, myotonic dystrophy, Guillain-Barré syndrome, and brainstem lesions, have been examined through measures of the size and latency of the MEP (e.g., Muellbacher, Mathis, & Hess, 1994; Urban, Hopf, Fleischer, Zorowka, & Müller-Forell, 1997). A noted benefit of TMS has been its utility in identifying early, subclinical upper motor neuron deficits (Pouget et al., 2000).

Determining levels of cortical excitability

Various measures can be used to determine cortical excitability or responsiveness to stimulation.

- *Motor threshold*: lowest intensity of TMS stimulation required to produce a consistent motor evoked potential (MEP) in the muscle of interest. An increased motor threshold for a given individual indicates reduced excitability (i.e., greater stimulation required to activate the cortical region), whereas a decreased motor threshold indicates increased excitability.
- *Motor evoked potential (MEP) amplitudes*: the size of the electrical potential (in microvolts) recorded in the muscle of interest when the corticobulbar/ spinal pathways are stimulated. Increased amplitudes indicate increased excitability.
- *Input-output responsiveness curves*: This procedure involves taking a set of MEP amplitude recordings (output) at different levels of input (i.e., different voluntary contraction or TMS stimulation levels). Regression curves are applied to the MEP amplitudes, with measures of y-intercept and slope derived, representing sensitivity and gain (i.e., degree of facilitation associated with increased inputs), respectively.

TMS has been used to examine tongue motor cortex excitability in healthy speakers on the basis of MEP amplitudes (Fadiga, Craighero, Buccino, & Rizzolatti, 2002) and motor thresholds (Muellbacher, Boroojerdi, Ziemann, & Hallett, 2001).

Investigating inhibitory and facilitatory intracortical circuits

Intracortical inhibition and facilitation can be studied using TMS presented as a paired-pulse and with silent periods.

Paired-pulse TMS involves delivering a subthreshold conditioning TMS pulse that activates cortical neurons but that is too small to result in any descending spinal cord activation, followed by a second, test pulse (Hallett, 2000). The stimulus intensity and the interstimulus interval between conditioning and test pulses appear to affect which intracortical circuits are activated (i.e., facilitatory or inhibitory), which, in turn, affects the MEP amplitudes recorded following the test stimulus (Kobayashi & Pascual-Leone, 2003). Typically, interstimulus intervals of less than 4ms induce inhibition, while interstimulus intervals of 5ms to 30ms induce facilitation (George et al., 1999; Kobayashi & Pascual-Leone, 2003). Electromyographic silent periods refer to the period in which EMG activity is suppressed in a voluntarily contracted muscle following suprathreshold TMS stimulation. The initial portion of the silent period is believed to be due in part to spinal cord refractoriness, with the latter portion due to cortical inhibition (Hallett, 2000).

Intracortical inhibition and facilitation of the tongue motor cortex has been studied using cortical silent periods (Katayama et al., 2001) and paired-pulse TMS (Muellbacher et al., 2001). Sommer, Wischer, Teragau, and Paulus (2003) used single pulse and paired-pulse TMS to investigate excitability and intracortical inhibition and facilitation of the dominant hand motor cortex in a group of 18 right-handed speakers with developmental stuttering. Their study was driven by a proposal that persistent developmental stuttering is a task-specific dystonia characterised by reduced intracortical inhibition. Interestingly, intracortical inhibition and facilitation were found to be normal, while motor thresholds were increased, suggestive of reduced motor cortical excitability.

Inducing neuromodulation

Repetitive TMS (rTMS) involves delivering trains of TMS pulses (≥ 1 Hz or equal to or greater than one per second), which summate to effect temporary neural modulation. This modulation can comprise inhibition or facilitation of cortical excitability depending on stimulation intensity, frequency, and duration (Pascual-Leone et al., 1998). Slow rTMS in the 1Hz frequency range has been found to transiently decrease excitability, while rapid rTMS, at frequencies of 5Hz and higher, looks to transiently increase excitability (Hallett, 2000; Kobayashi & Pascual-Leone, 2003). In addition to investigating behavioural effects (e.g., reduction or increase in stuttering) induced by TMS neuromodulation, rTMS can also be used to temporally disrupt neural activity, thereby creating a temporary virtual lesion, to evaluate a cortical region's function (Hallett, 2000).

TMS applications in motor speech treatment

The application of TMS in the treatment of motor speech disorders is a growing, yet at present, a limited and under-developed field. Treatment protocols have involved the use of rTMS on the basis of its capability in effecting neuromodulation and have been found to be successful in regulating cortical function and normalising the balance of inter-hemispheric excitability with resultant changes in behaviour in a range of disorders, including depression (e.g., Pascual-Leone, Rubio, Pallardo, & Catalá, 1996), motor dysfunction and aphasia associated with stroke (e.g., Martin et al., 2004), and motor and vocal function in Parkinson's disease (e.g., Dias et al., 2006). Significant improvements in

fundamental frequency and voice intensity in 30 patients with Parkinson's disease were noted after just a single session of rTMS (Dias et al., 2006). Ingham, Fox, Ingham, Collins, and Pridgen (2000) delivered slow rTMS (1Hz) to the right supplementary motor area (SMA) of five persons who stuttered for 20 minutes per day for 10 consecutive days to reduce the SMA overactivation that was observed by neuroimaging. One of the persons who stuttered showed a reduction in stuttering approximately one month following the TMS program, with this reduction sustained for at least five months. No behavioural changes were noted for the remaining persons who stuttered.

Limitations of TMS and methodological considerations

There are a number of limitations of TMS and methodological considerations that need to be considered when planning a TMS study. First, the magnetic field generated by TMS stimulates to a depth of only approximately 2cm below the cortical surface (George et al., 1999) limiting the brain regions that can be stimulated to those on the cortical surface, rather than deep brain structures. Second, TMS typically indirectly stimulates pyramidal neurons as it preferentially stimulates those neurons that are parallel to the cortical surface. These preferentially stimulated neurons are believed to be mostly interneurons, which indirectly and trans-synaptically activate the pyramidal neurons (Pascual-Leone et al., 1998). Thirdly, MEP recordings need to be made from stationary muscles and, hence, speech tasks cannot be utilised. Tasks that require participants to imagine speaking could be utilised instead, however, as neuroimaging has shown that brain activations during imagined speech resemble those during overt speech (Ingham et al., 2000). Finally, the optimal TMS parameter combinations to be used for neuromodulatory treatment (i.e., frequency and number of TMS pulses and sessions) are not yet well understood and require further study.

Conclusion

The present review illustrates how TMS can be used as an adjunct to neuroimaging and other neurophysiological techniques to investigate potential neural disturbances underlying motor speech disorders. By using TMS in future studies of motor speech disorders it is anticipated that not only will our understanding of the neurophysiological underpinnings be better informed, but the options and efficacy of treatment that can be offered will also improve.

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Dr Justine Goozée's research has focused on the physiological assessment and treatment of articulatory dysfunction in motor speech disorders. This research has recently been expanded to include the neurophysiological approach, transcranial magnetic stimulation (TMS), which she conducts in collaboration with the School of Human Movement Studies at The University of Queensland, following training at Harvard Medical School.

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Functional reading therapy for individuals with acquired reading difficulties

A preliminary investigation exploring its effectiveness

Naomi Cocks, Niina Matthews, Lisa Barnett, Emma Phillips, Ruth Middleton, Joan Gregoire-Clarke, and Madeline Cruice

Functional reading therapy targets everyday reading such as books or magazines. There is limited research investigating the effectiveness of functional reading therapy for acquired reading difficulties. The aim of this preliminary research, involving a series of four case studies, was to evaluate the effectiveness of functional reading therapy for individuals with acquired reading difficulties. All participants had different levels of reading impairment and were at least four years post-brain damage. Following individually tailored therapy, all participants demonstrated a reduction in reading errors, showed increased comprehension, and reported increased confidence with reading. Other improvements relating to rate of reading and language, such as association naming, were found in some but not all participants. Some participants also reported further psychosocial benefits, such as increased participation in reading activities. The results from this study are promising and suggest that functional reading therapy can be effective even for participants up to 18 years post-brain damage.

Reading difficulties are a common consequence of brain damage (Richardson, 2000), and can restrict individuals' access to everyday written materials within their natural environment. Social isolation, depression and, low self confidence following brain damage are recognised as negative long term outcomes, resulting from the inability of an individual to participate in meaningful activities, including reading (e.g., Hoofien, Gilboa, Vakil, & Donovan, 2001). Two-thirds of the traumatic brain injury population are under the age of 30 and most are of working age (Ponsford, Sloan, & Snow, 1995), where basic literacy is important for performance in the workplace, and literacy difficulties may impact upon the individual's confidence and motivation (Department for Education and Skills, 2007). Improvement in literacy could help encourage the individual to access learning, to read for pleasure, and to increase their confidence in returning to the workplace. The latter may have significant importance as it could have implications

for identity, meaningfulness, responsibility, and the role of an individual in family and society. Assessment and therapy approaches that address the barriers to everyday reading are therefore essential for individuals with brain injury.

There are surprisingly few assessments available that assess everyday reading difficulties commonly found in individuals who have sustained brain damage. While a number of widely used assessments for people with aphasia assess aspects of reading ability, such as the Mount Wilga High Level Language Test (MWHLLT) (Christie, Clark, & Mortensen, 1986), or the Western Aphasia Battery (Kertesz, 1982) such assessments are often based on standardised and artificial reading stimuli and often do not measure the functional impact that the difficulties have on an individual performing an everyday task (Wallace, Evans, Arnold, & Hux 2007; Worrall & Fratalli, 2000).

Similarly, there is limited published research that has explored the effectiveness of functional reading therapy programs. This is despite the fact that reading plays a part in a variety of everyday activities (Parr, 1995), ranging from reading instructions, utility bills, emails, magazines, newspapers, and books. The aim of the functional approach is text-level reading, for example reading a whole article or whole page of a book, rather than single-word or sentence-level reading. In addition, it allows for planning of activities that are relevant to the client (e.g., a personally chosen novel), and it combines both linguistic variables and functional elements (e.g., using summarising and recall strategies).

Despite Parr's (1995) research on the significant changes to functional reading practices as a result of aphasia, much research on reading difficulties following brain damage has continued to concentrate on single-word reading (e.g., Peach, 2002) at the expense of functional reading and reading for pleasure. As a consequence, very little literature has been published which addresses more mild reading difficulties, such as problems with attention and concentration, which might be seen in traumatic brain injury or in high functioning stroke patients (Coelho, 2005). Fawcus, Kerr, Whitehead, and Williams (1991) published a reading therapy manual that included a range of strategies recommended for individuals with acquired reading difficulties, including summarising, scanning and covering parts of the text or underlining salient words. However the effectiveness of these strategies in therapy has not been systematically tested, and the effectiveness of some functional reading therapy is only incidentally reported. For example, Worrall and Fratalli (2000) described a client who pre-morbidly had enjoyed reading restaurant reviews. As a result of his aphasia, he did not feel confident in his ability to

KEYWORDS

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DYSLEXIA

APHASIA

FUNCTIONAL
THERAPY

HEAD INJURY

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comprehend complex and long texts. By working on reviews that were shorter and written in more simple language, the client was able to continue enjoying reading topics of personal interest. An increase in the client's activities relating to reading was found; however, no information regarding the client's reading accuracy was reported. Little is known about whether functional reading therapy programs for individuals with acquired reading difficulties result in changes in the participants' reading accuracy, reading comprehension, self confidence, or in life participation.

These case studies comprise a preliminary investigation into the effectiveness of individually tailored functional reading programs for four adults with a range of acquired reading difficulties. The therapy included activities with personally relevant reading material. In addition to measures of reading accuracy, comprehension and rate, the psychosocial benefits were also considered.

Method

Participants

Participants were recruited from a day centre (run by a brain injury charity) that provided daily activities for adults with head injury. Participants self-referred to the study after seeing an advertisement for the study in the day centre. Participants were eligible to take part if they had self-reported difficulties as a result of stroke or head injury. Participants included those who had acquired dyslexia¹ and also those who had reading difficulties as a result of cognitive difficulties, for example, an inability to remember what they had read. Potential participants were excluded if they were illiterate prior to their stroke or head injury or if their reading difficulties were primarily due to a visual impairment or perceptual difficulties. All participants were monolingual English speakers. Case information is reported in table 1.

Assessments

The investigators devised a functional and appropriate assessment pack to meet the specific needs of the research study, which included a case history form, functional reading extracts with associated comprehension questions, sections from the MWHLLT (Christie et al., 1986) and a reading confidence questionnaire. These are described in more detail below.

A project case history form collected information from participants regarding: daily activities and hobbies; perceptions of the support group they attended; difficulties in communicating,

e.g., memory; understanding jokes; pre-morbid reading levels; interests in reading; difficulties with or barriers to reading; strategies used; current reading habits; feelings about reading; and what they hoped to achieve. The investigators then chose relevant materials to increase motivation for the project, with a view to facilitate transfer, generalisation and maintenance following completion of the project.

The investigators devised a range of functional reading extracts which assessed an individual's comprehension of the text using six set questions (who, where, when, what happened, how, and why), ability to recall or summarise, number and type of errors made reading aloud, and any spontaneous strategy use. Ten extracts with a range of complexity were chosen from newspapers (tabloid and sheet), magazines and novels. Each extract was rated for complexity with a text analyser from Using English (<http://www.usingenglish.com/>). The text analyser rated complexity in several ways, including using the Gunning Fog Index² (Gunning, 1952). The extracts covered a range of topics, including music, current affairs, and fantasy. For copyright reasons, the extracts cannot be included in this paper. While 10 extracts were prepared, participants only completed 2–5 extracts.

Relevant sections of the MWHLLT (Christie et al., 1986; naming, verbal explanation, planning, auditory memory and reading) were conducted for an overall profile of the participants' strengths and weaknesses in relation to the cognitive and linguistic processes associated with reading.

Finally, the investigators devised a 19-item reading confidence questionnaire. Twelve items addressed confidence when reading in different situations with different people, and comprehension and recall of what was read. For example, "How confident do you feel about reading out loud, and in front of a stranger?". The remaining seven items enquired about negative emotions associated with reading, namely anxiety, anger, upset, worry, and frustration. All items were rated on a 5-point Likert scale. The confidence section was scored as 1 ("not at all confident") to 5 ("very confident"), while the negative emotions section was scored in reverse, i.e., 1 ("not at all"), to 5 ("very"). The initial assessments generally took 1–2 sessions, followed by 5–7 therapy sessions depending on participants' attendance at the day centre, and 1–2 reassessment sessions, over a 10-week period. Sessions were typically one hour in length and were carried out at the centre. The investigators wrote weekly case notes, gave weekly verbal handovers to the participants' key

Table 1. Participant information

Initials	Gender	Age	Personal information	Time post injury	Difficulties
MM	Male	35 yrs	Poor attendance at school and left aged 15; had previously received seven sessions of speech and language therapy focusing on letter recognition, letter–sound correspondence, and irregular words	18 yrs post TBI	Paranoia; poor short-term memory and attention; pre-morbid history of dyslexia and language delay; reading difficulties associated with cognitive impairment
PW	Female	43 yrs	Sustained injury in motor vehicle accident	18 yrs post TBI	Profound retrograde amnesia; poor short-term and long-term memory; acquired dyslexia and reading difficulties associated with cognitive impairment
TU	Male	60 yrs	Avid reader before injury; sustained injury at work as a builder and crane operator	8 yrs post TBI	Poor short-term memory; mild anomia; acquired dyslexia and reading difficulties associated with cognitive impairment
KJ	Male	45 yrs	Completed education at 16; worked as a cleaner prior to injury	5 yrs post brain damage caused by hydrocephalus secondary to TB meningitis	Poor short-term and long-term memory; Phonological dyslexia and reading difficulties associated with cognitive impairment

workers, and in the final session, provided information and further activities and materials for the participant.

Therapy: approaches, goals and personal relevance

For all participants, therapy involved learning functional strategies to aid reading, with an emphasis on independent use. Strategies such as highlighting keywords to understand the gist of the text and using prompt sheets to help recall were used. However, all therapy was tailored to the individual participant and modified according to individual strengths, areas of need, preferences and interests. For example, one participant needed several sessions in order to identify keywords independently in the text, whereas another participant learned this quickly and moved on to therapy that targeted phoneme to grapheme conversion. All participants had materials modified visually, often by modifying font or increasing font size, and by using colour contrasts. Therapy-related information is detailed in table 2.

Outcome measures

Weekly baselines were completed throughout therapy to monitor progress, in addition to comparisons made with pre- and post therapy assessments. These collected information on reading accuracy (reading aloud), comprehension, ability to summarise, and use of strategies. Materials used for the weekly baselines were chosen to reflect the participant's interests (see table 2). Each investigator analysed the baseline texts chosen for each individual to ensure that they were similar in complexity to each other, using either SMOG³ values (McLaughlin 1969) or Flesch-Kincaid measures⁴ (Flesch, 1948).

Results

Results for four individuals are reported in tables 3 and 4. Feedback questionnaires with participants and key-workers revealed positive changes for the individuals involved.

MM's reading rate on assessment extracts and weekly baselines remained largely stable across the project; however, his reading accuracy improved as reading errors decreased. MM's reading confidence decreased and negative emotions increased post therapy. This contradicted

his self-report on the post therapy feedback questionnaire, wherein he reported positive outcomes.

PW showed gains across all measures. Her reading accuracy increased, her rate was largely stable, and she comprehended more of the text in each extract. Association naming and sentence construction (MWHLLT) also improved. Her reading confidence increased and negative emotions decreased, and she increased her community participation by visiting the library.

TU's most observable gain from therapy was a substantial increase in reading accuracy which was evident in the pre and post extracts and in weekly baselines. His awareness of reading errors increased, and he often self-corrected. Reading rate remained stable, and some improvement in comprehension was noted. TU also improved on passage recall and association naming (MWHLLT). His reading confidence increased, although emotions related to reading did not change.

KJ's reading accuracy improved as a result of improved grapheme to phoneme conversion abilities, which had a positive impact upon his comprehension of the texts. Reading errors decreased also across the weekly baseline. He displayed similar visual errors post therapy, but made very few phonological or morphological errors. His rate was generally stable or even slowed over the project, as KJ took more time to read carefully. His confidence and emotions (on 7 of the 19 questionnaire items) showed positive change. He reported that he found himself reading more on a day-to-day basis. KJ also reported he felt his speech had become "more fluent" when reading as he was able to break words down and sound them out. The student clinician also observed KJ's improved confidence and felt that he was now more "open to learn" new things.

Discussion

This study investigated the effectiveness of a functional reading program for four people with acquired reading difficulties. All participants were at least four years post brain damage, with two participants who had acquired their brain damage 18 years previously. All four participants improved in reading accuracy, reading comprehension, and reading

Table 2. Therapy related information for each participant

Participant	Reading prior to therapy	Goals for therapy	Materials and approaches
MM	Newspapers, letters and bills Able to read short pieces of text, but struggled to glean and recall the salient information	To remember what he had read, without needing to re-read the text several times	Mock and real bills and letters, horoscopes, newspaper articles, and R&B music reviews Identifying and highlighting keywords, then re-reading these to aid memory. Prompt cards to aid independence, and as reminders to remain calm and positive about abilities
PW	Novels Slow reading rate, errors when reading aloud, particularly substituting one word for another, difficulty reading numbers, recalling chunks of text read and drawing appropriate inferences from text	To use compensatory strategies at a functional level to enable her to complete a novel, and to retain and recall the information read over time	A novel that she had read previously but was unable to recall. Summarising, writing down key points in a note book, blocking out the line of text below the line being read, using her finger or a ruler to facilitate her reading. Using a dictionary to research unfamiliar words. Prompt card to remind her to use strategies
TU	Newspapers, letters, bills Errors when reading aloud, slow reading rate, and difficulties with comprehension and recall	To be able to remember what he had read, and to discuss this with others, especially his wife. To improve his confidence	BBC <i>Wildlife</i> magazine Identifying keywords (nouns and verbs), starting with short sentences and building up to short articles, aided with prompt cards to support independent use
KJ	Newspapers Difficulty remembering what he had read and difficulty drawing inferences from text	To improve reading comprehension and read more fluently out loud	Geography text, the <i>National Geographic Magazine</i> , and a history novel about the Battle of Britain. Strategic approaches such as summarising text, and more targeted phoneme to grapheme conversion therapy, prompt cards to encourage independence

Participant	Extract Number	Number of reading errors		Reading rate (in minutes; seconds)		Reading comprehension (number of questions correct, total = 6)	
		Pre-therapy	Post-therapy	Pre-therapy	Post-therapy	Pre-therapy	Post-therapy
MM	1	61	43	12;14	12;3	N/A	N/A
	2	54	32	11;6	9;39	N/A	N/A
PW	1	9	5	7;55	6;20	1	3
	2	13	7	7;50	7	3	6
	3	12	6	10;50	7	0	3
KJ	1	46	30	3;40	3;20	2	6
	2	19	13	2;50	4;19	3	5
TU		% of total words		Reading aloud			
	1	17.3	8.9	2;7	2;3	4	4.5
	2	18.7	7.6	3;4	3;2	4	5
	3	18.9	6.8	3;23	3;20	3	4
	4	18	4.4	2;33	2;30	2	4.5
	5	18	8.2	2;46	2;43	2	4

Note: Results for the four study participants collected pre and post therapy using a range of reading extracts of varying complexity.

Participant	Reading confidence questionnaire* Pre/post	Participant feedback questionnaire	Key-worker feedback questionnaire
MM	Negative change Confidence 45/34 Emotions 23/26	Increased confidence Improved patience with reading	Increased feeling of control over his life Achieved something positive during a difficult time in his life Project encouraged regular attendance at day centre
PW	Positive change Confidence 37/47 Emotions 15/8	Felt more free to read by herself Reading was much more enjoyable Confidence in reading had increased Reported visiting the library three times during the 6 weeks of therapy Prior to the project, she never visited the library because there was "no assistance"	Increased confidence; Learnt methods to help her to retain information when reading; Gained a very positive attitude through taking part in the study
TU	Variable Confidence 30/42 Emotions 17/16	Entering into more discussions about the morning papers at his day centre Reported having conversations with people about what he had read Identified that underlining keywords as a strategy in recalling information	N/A
KJ	Positive change Confidence 11/14 (out of 20) Emotions 12/5 (out of 15)	Reported that the project provided him with "strategies to use for the future" Reported it had given him a way of "learning new things" Took up more leisure pursuits such as going to the library	Confidence in taking part in goal setting activities Overall self-esteem improved

* The range of scores for Reading confidence is 12 to 60, with 60 being the most desirable level the participant can attain. The range of scores for Reading emotions is 7 to 35, with 7 being the most desirable level of negative emotions the participant can attain.

confidence following the reading program. Other improvements that were relevant to some but not all of the participants included increased test scores on MWHLLT sections (association naming, naming, sentence construction and passage recall) and increased length of summaries (reflecting more detail recalled). Participants generally reported less negative emotions post therapy. Other psychosocial benefits that were reported by some but not all of the participants included a feeling of control over one's life, the joy in achieving something positive, and also increased participation, independence and patience with reading. Two participants had visited their local libraries, and two participants also engaged more in the activities or processes of the day centre. Finally, the study shows that reading rate,

a measure often used to determine functional reading level, is not a sensitive, nor perhaps a sensible intervention target. This is especially the case when the strategies typically slow the pace in favour of accuracy and comprehension.

Previous research has suggested that single-word level therapy programs are effective for acquired reading difficulties (e.g., DePatz, 1986; Peach, 2002). The findings from the current study support those by Coelho (2005) that suggest that text-level functional reading therapy is also effective for people with acquired reading difficulties. The results are promising, particularly given the limited length (5–6 therapy sessions), and suggest that improvements were seen in participants who were more than four years post-brain-damage, including two participants who were more

than 18 years post brain-damage. Therapy programs are not typically offered to clients who are so many years post injury as the majority of research suggests that the first few months are crucial for improvement (e.g., Cherney & Robey, 2001). The findings thus challenge current models of service delivery.

The findings should be interpreted with caution. The current study reports a number of single case studies and included participants with a range of different aetiologies and difficulties. It is therefore difficult to determine whether the findings can be generalised to the wider population. Future research could include larger sample sizes with more homogenous presentations and etiologies. Carrying out further single case studies using a similar approach would also add support to the current findings.

There were also a number of limitations regarding methodology. As only one baseline assessment was carried out, one cannot be sure whether the improvement was due to therapy or not. Therapy took place over a very limited time period (5–6 sessions). It is therefore possible that if therapy was extended, more substantial gains could have been made. As no follow-up assessments were carried out, we cannot determine whether the changes in reading accuracy and psychosocial improvements were sustained after the completion of therapy. Future research should therefore include multiple baseline assessments, a longer therapy phase and post therapy follow-up assessment. Some measurements should be interpreted cautiously. The confidence ratings were made subjectively by the participants in the presence of the investigators. It is possible that their presence may have influenced the participants' response because the participants knew that the investigators wanted them to improve in confidence.

Summary

This preliminary investigation was a first step in determining whether a personally relevant functional reading therapy program is effective for people with acquired reading difficulties. The results are promising with benefits in accuracy, comprehension, confidence, and social participation and suggest that further research which addresses the limitations above would be worthwhile.

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- 1 Acquired dyslexia is a condition that commonly co-occurs with aphasia and is characterised by the loss of a previously possessed ability to comprehend the meaning or significance of written words, despite intact vision. There are a range of different types of dyslexia including pure alexia, surface dyslexia, deep dyslexia and phonological dyslexia (Chapey & Hallowell, 2001).
- 2 A measure of number of years of full-time formal education a person hypothetically requires in order to read the text (Gunning, 1952). Texts with Gunning Fog indices of 12 or less are readable for most literate adults.
- 3 The Simple Measure of Gobbledygook (SMOG) (McLaughlin, 1969) is a measure of readability. It calculates a grade of reading ability using the following formula:

$$\text{grade} = 1.043 \sqrt{30 \times \frac{\text{number of polysyllables}}{\text{number of sentences}}} + 3.129$$
- 4 Measure of readability available on Microsoft Office Word.

Dr Cocks and **Dr Cruice** trained and worked as speech pathologists in Australia before moving to London in 2005 and 2002 respectively, where they now work as senior lecturers and clinical educators at the reading clinic at City University. Information about the reading clinic can be found at <http://www.city.ac.uk/lcs/compass/readingclinic/readingclinic.html>. **Niina Matthews, Joan Gregoire-Clarke, Lisa Barnett, Ruth Middleton** and **Emma Phillips** graduated from City University in 2008. They now work as speech and language therapists at various locations around the UK.



What's the evidence?

Jenny Harasty



Jenny Harasty

This is the first of hopefully many future columns that will provide a forum for discussing evidence based practice (EBP) and its relevance to the practice of speech pathology. The "What's the evidence?" column is to be coordinated by Jenny Harasty, Speech Pathology Australia National Advisor for Research and Evidence Based Practice. What's the evidence? will feature in forthcoming editions of ACQ, and will align with the identified theme of the journal. It is anticipated that What's the evidence? will provide a professional forum for members to think about EBP and reflect on their own clinical practice. In particular, the column will aim to:

- provide a professional forum for EBP discussion and reflection;
- provide a framework for appraising topics and published papers that relate to everyday clinical practice;
- provide an overview and appraisal of current best evidence in the field, leading to a useable "clinical bottom line" or recommendations for practice.

As an introduction to EBP, in this first column Jenny Harasty provides an outline of what EBP is and what the steps involved in incorporating the evidence into clinical practice are. Please feel free to contact Jenny with your thoughts, queries or reflections on issues raised in this column. Jenny is particularly keen to hear from practitioners regarding their experiences in relation to EBP and to provide practical support and advice to practitioners as they attempt to incorporate the best available evidence into their practice.

What is evidence based practice?

I was asked the other day what evidence based practice is. Is it ensuring that we have documented all that we do? Well no – that is accountability and while very important, it is not evidence based practice. Is it having data or other evidence that demonstrates the effectiveness of our treatment? No, that is evaluation of our interventions. Again crucial, but not evidence based practice. Evidence based practice is the integration of clinical expertise and the best available research and evidence into clinical interventions. Evidence may be found in published peer-reviewed articles in scientific journals and in verbal reviews at expert conferences and workshops. Evidence based practice does not negate clinical expertise and clinician judgement. However, it emphasises that clinical expertise must be informed by the best available evidence. The original definition of EBP is from the medical literature and says that:

Evidence based ... [practice] is the conscientious, explicit, and judicious use of current best evidence in making decisions about the care of individual patients. The practice of evidence based ... [practice] means integrating individual clinical expertise with the best available external clinical evidence from systematic research (Sackett et al., 1996, p. 71).

Evaluating the scientific evidence

Evaluating the evidence is easier than it used to be as there are now many guides available. The National Health and

Medical Research Council (NH&MRC) "Levels of Evidence" is one such guide that provides a hierarchy from which the different levels of scientific information can be evaluated (see box 1).

Box 1. Levels of evidence

Level I	Evidence obtained from a systematic review of all relevant randomised controlled trials.
Level II	Evidence obtained from at least one well-designed randomised controlled trial.
Level III	Evidence obtained from well-designed controlled trials without randomisation. Evidence obtained from well-designed cohort or case control analytic studies, preferably from more than one centre or research group. Evidence obtained from multiple time series, with or without the intervention. Dramatic results in uncontrolled experiments.
Level IV	Opinion of respected authorities, based on clinical experience, descriptive studies, or reports of expert committees.

Source: NH&MRC: http://www.nhmrc.gov.au/_files_nhmrc/file/publications/synopses/cp30.pdf

As shown in box 1, the highest level of evidence (Level I) is considered to be a systematic review of a number of randomised double-blind placebo controlled trials. In a randomised control trial, participants are randomly assigned to either a placebo group (which receives some form of intervention that does not include the intervention being evaluated), or a treatment group (that receives the intervention being evaluated). Outcome data from both groups are collected and analysed. "Double blind" means that neither the participants nor the researchers know which group the participants were in until after the data are collected/analysed. A systematic review is a review of all the randomised control trials published in an area and makes a general finding based upon their group results, using specific meta-analytic statistics (see <http://udel.edu/~mcdonald/statmeta.html>).

While systematic reviews of randomised controlled trials are said to be the gold standard in medical research (Greenhalgh, 2001), it is important to acknowledge that this type of research design will not be appropriate for all research studies (see Greenhalgh, 2001, p. 47). Indeed, many important and valid studies in the field of qualitative research do not feature the hierarchy of evidence as outlined above. For this reason, it is important that clinical practice be informed by information obtained from different sources, including research projects that incorporate other levels of evidence such as controlled trials without blinding or random allocation, cohort studies, cross sectional surveys and single case designs. Readers interested in finding out more about these research designs are encouraged to refer to Dollaghan (2007) and Greenhalgh (2001).

Valuable information is also available by means other than that provided through research projects. For example, papers that describe hypotheses and theories will facilitate understanding of theoretical frameworks underpinning clinical interventions. They will also provide a first step in designing future studies that aim to investigate the efficacy of treatment interventions. Information provided in workshops and seminars will also provide relevant information, particularly when the information is underpinned by research that is robust in design and interpretation.

A process for EBP in speech pathology

An evidence based practice process has been described in the speech pathology literature (Gillam & Gillam, 2006). The steps in this process are defined as:

- 1) creating a general or specific clinical question;
- 2) finding external evidence that pertains to the question;
- 3) determining the level of evidence that the study represents and critically evaluating the study;
- 4) evaluating the internal evidence related to client-patient factors;
- 5) evaluating the internal evidence related to clinician-agency factors;
- 6) making a decision by integrating the evidence, and
- 7) evaluating the outcomes of the decision (p. 304).

As an addition to the above seven steps, evaluating the evidence relating to clinician-agency factors has been added (Nelson & Steele, 2006). This extra step addresses the importance of an intervention being effective *and* economical. Specifically, should an intervention require a mode of service delivery that may be difficult to implement and sustain (e.g., requiring support four times a day), it will likely not be implemented. Consideration of clinician-agency factors ensures that practical aspects of the intervention program (such as frequency and duration) as well as its costs are taken into account as part of the evidence based process.

Journals and websites for EBP in speech pathology

There are journals devoted to systemic review of interventions in our field, such as "Evidence-Based Practice (EBP) Briefs", published by Pearson (<http://www.speechandlanguage.com>). This journal has easy-to-read reviews of the literature on topics of interest to working clinicians. Another journal that is dedicated to EBP in speech pathology is *Evidence-Based Communication Assessment and Intervention* (Psychology Press; <http://www.languagedisorderarena.com>).

Aside from international journals and publications, a number of more hands-on resources exist to provide information and support in relation to EBP. The NSW Evidence Based Practice Network (http://www.ciap.health.nsw.gov.au/specialties/ebp_sp_path/) was established in 2002 to provide opportunities for speech pathologists in NSW to learn about EBP and to evaluate the available evidence in relation to clinical practice. Interested speech pathologists meet to evaluate the evidence and write summaries on specific clinical questions (called Critically Appraised Topics [CATs]). For example, the child language clinical group of the NSW EBP Network has been considering the following clinical questions: 1) in school-aged children with speech language impairment (SLI), is an in-class school-based model better than a withdrawal model in managing SLI in the classroom?; 2) in school-aged children with SLI, is a school-based treatment model an effective way of managing SLI in the classroom? Other

clinical groups within this network include: paediatric feeding, adult swallowing, and voice. Speech pathologists who are interested in joining a clinical group must undertake a training workshop in the principles and procedures of the network.

SpeechBITE™ (Speech Pathology Database for Best Interventions and Treatment Efficacy; <http://www.speechbite.com>) was launched in 2008 and is an internet-based resource designed to assist speech pathologists in evidence based clinical decision making. With Dr Leanne Togher as project leader and Kate Smith as project manager, SpeechBITE™ provides abstracts of speech, language, communication, and swallowing intervention papers that have been published in scientific journals and then adds an expert rating out of 10 for the paper based upon its design, statistical methodology and other factors. SpeechBITE™ is available free of charge on the internet. Look up your area of interest on the website and find abstracted empirical scientific evidence for or against your treatments.

The utility of the above resources was recently demonstrated by a group of Speech Pathology Australia Association members. While undertaking training in how to evaluate the evidence, the efficacy of a number of marketed child language therapy programs was considered. After devising a relevant clinical question, a search of the literature was undertaken using SpeechBITE™. A number of relevant articles were identified and downloaded from major databases for medical and educational articles: PubMed (<http://www.ncbi.nlm.nih.gov/sites/entrez?db=pubmed>), Medline (http://www.nlm.nih.gov/databases/databases_medline.html) and Eric (<http://www.eric.ed.gov/>). Following evaluation of the articles it was agreed that there was no sound evidence to support the use of these child language programs. Attendees agreed that resources such as SpeechBITE™ certainly made it easier to identify and evaluate the available evidence, and thereby enabled clinicians to provide advice and professional opinion to a client that was informed by the best available evidence.

Next steps

To reduce the perceived gap between speech pathology practice and research underpinning practice, more research and increased numbers of researchers (especially clinical researchers) are required. If you are interested in conducting clinical research but do not have knowledge and/or experience in the area, it is important that you access the support of experienced researchers who will be able to guide you along the research path. You might even consider accessing the support of a mentor. This can be done through undertaking a postgraduate course/ degree or through enrolling in the mentoring program (<http://www.speechpathologyaustralia.org.au/Content.aspx?p=234>) offered through Speech Pathology Australia. By accessing appropriate support and mentoring when undertaking research, the potential for your research to be conducted in an appropriate manner will be heightened, and your research findings and recommendations will not only be robust and open to scrutiny but will contribute meaningfully to the knowledge base and scientific basis of the profession. I look forward to receiving your comments and engaging in discussion regarding the issues that impact our ability to incorporate the evidence into our clinical practice, and am excited by the prospect these discussions may have in relation to the evidence base that underpin our clinical practice.

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Research update

Motor speech disorders research at UQ

Deborah Theodoros



Deborah Theodoros

HISTORICALLY, RESEARCH IN MOTOR SPEECH

disorders at the University of Queensland has focused on the assessment of dysarthria and apraxia of speech utilising perceptual, acoustic, and instrumental techniques in order to investigate the underlying pathophysiology of these disorders. Such research continues to be conducted in various populations such as traumatic brain injury, Friedreich's ataxia, stroke, and Parkinson's disease (PD). More recently, however, research in motor speech disorders has involved the development of alternative service delivery models, and investigations of treatment efficacy.

Over the last five years, researchers in the Telerehabilitation Research Unit (www.uq.edu.au/telerehabilitation) have developed and validated telerehabilitation applications to assess and treat people with motor speech disorders across the Internet. This mode of service delivery has the potential to overcome the difficulties encountered by many people living in rural and remote areas, and those with a disability, in accessing therapy services. One study in this area involved the assessment and treatment of hypokinetic dysarthria online using the Lee Silverman Treatment (LSVT®) program. Results from this randomised controlled trial revealed that significant improvements in speech and voice, comparable to those achieved face-to-face, can be achieved in people with PD when treated across the Internet (submitted for publication). In another study, the online assessment of dysarthria and apraxia of speech has been found to be comparable to results obtained face-to-face (Hill, Theodoros, Russell, & Ward, in press; Hill, Theodoros, Russell, & Ward, 2008). Research in telerehabilitation has led to the development of eHAB®, a portable multi-media videoconferencing unit which connects to the Internet via the mobile telephone network. This system is designed to be placed in the person's home.

Treatment efficacy research in motor speech disorders has involved an investigation into the effectiveness of the LSVT® in the management of dysarthric speakers with non-progressive dysarthria. Although originally developed for the treatment of hypokinetic dysarthria, the LSVT® has been shown in single case studies to improve speech intelligibility in other types of dysarthria. These results are thought to

be due to the global effect of increased loudness and effort affecting other subsystems of the speech mechanism beyond the respiratory-laryngeal systems. This study in which people were treated with either LSVT® or traditional dysarthria therapy revealed that both treatments, when delivered intensively (one hour per day, four days per week, for four weeks) resulted in significant improvements in certain aspects of speech production (Wenke, Theodoros, & Cornwell, 2008, 2009).

Future research in motor speech disorders will continue to pursue the development of treatment protocols based on the principles of motor learning and neuroplasticity, and on technology-based methods of service delivery which will assist clinicians to meet the health challenges of the future.

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Webwords 36

Motor speech disorders

Caroline Bowen

There is little point in telling Speechwoman not to worry. Webwords has tried, but the over-conscientious doyenne of elastic webbing, Lycra, and Spandex daywear, stretchwear for the gym and what's-best-for-us on the Internet worries constantly. High on her list of key concerns are midriff bulge and the standard of web-based information relating to communication sciences and disorders. Webwords found her in deep despair after a frustrating week of trawling for plain-English articles on motor speech disorders.

"What's up?"

That was all it took for the usually contained **Speechwoman**¹ to unleash a rare and uncharacteristic outburst.

"If there was an Internet booby prize for the communication disorder associated with the most misinformation", she said hotly, "it would surely be awarded to a site about childhood apraxia of speech."

"I know."

"Yes, well," she spluttered. "But do you also know that if you look on the Internet for soundly based information for families and consumers of speech-language pathology services, there is virtually nothing about dysarthria in children or adults or about acquired apraxia of speech either?"

"Nothing?"

"Virtually nothing."

"Crumbs."

"Crumbs indeed. And when you think you have found a good page you discover that it links to a site containing the most unutterable rubbish."

"May I quote you?"

"Quote me?"

"I have to help her write a column on motor speech disorders."

"Well, yes. Put the word out there by all means. But you'd better not say 'unutterable rubbish'."

"Blithering nonsense then."

"No!" At least she was laughing.

"OK. We'll call it other sites. But is it as bad as all that?"

Ever the optimist, Speechwoman admitted to being pleased with the clarity and accuracy of the **Childhood Apraxia of Speech**² page on the Victorian Better Health Guide (produced in consultation with and approved by Speech Pathology Australia) and the excellent **Family Start Guide**³ on the Apraxia-KIDS site.

Neurogenic speech disorders

Neurogenic speech disorders occur in children and adults. They are a heterogeneous group of developmental or acquired speech impairments generally referred to as the "motor" speech disorders. Frequently coexisting with dysphagia, cognitive dysfunction, or language impairment they affect all speech processes: respiration, phonation, voice, resonance, prosody, fluency, and articulation. Clients affected by these disorders face challenges on many fronts as they grapple with the consequences of perinatal anoxia/hypoxia or paediatric stroke; or the effects of acute brain injury due to trauma, viral, or bacterial infections, neurotoxins, tumours or CVA; or are progressively assailed by an unfolding neurological disease or condition. Inevitably, these challenges involve key quality of life issues. The ages of onset of the different pathologies underlying motor speech disorders vary widely. Cerebral palsy is present at or shortly after birth, myotonic muscular dystrophy emerges at any age from infancy onwards, Parkinson's

disease may have "young onset" before the age of 40, amyotrophic lateral sclerosis usually strikes between 40 and 70 years of age, and a range of neurodegenerative disease, stroke, and brain injury types tend to affect older adults.

The dysarthrias and apraxias

The motor speech disorders commonly diagnosed and treated by speech-language pathologists are the dysarthrias and apraxias. The dysarthrias may be flaccid, spastic, ataxic, hyperkinetic, hypokinetic or mixed in adults and children. The apraxias are apraxia of speech in adults and a different symptom complex with a confusingly similar name, childhood apraxia of speech, in children (Maassen, 2002).

The *dysarthrias* are due to weakness, incoordination or paralysis of the speech musculature. They are characterised by any combination of effortful or slurred speech, hyponasality, hypernasality, low or variable loudness, voice and prosodic difficulties, dysfluency, and breathing problems. These characteristics usually result in poor speech intelligibility, or even an absence of intelligible speech. Older people with dysarthria may have a particular difficulty with making themselves understood if their important communicative partners are contemporaries with age-related hearing loss and slowed cognitive processing.

- *Apraxia of speech (AOS)* involves difficulty planning and sequencing voluntary muscle movements related to speech. AOS can affect people at any age, but it is usually precipitated by stroke, head injury, tumour, or other neurological illness. Often accompanied by aphasia its characteristics are difficulty initiating speech movements, disrupted fluency with frequent pauses and restarts, groping for correct articulatory configurations, articulatory errors including distortions, and comparatively intact automatic speech.
- *Childhood apraxia of speech (CAS)* is a symptom complex rather than a unitary disorder. It is hypothesised by some researchers to be due to a genetically transmitted deficit in speech motor control, but this putative cause has not been confirmed and is the subject of ongoing research (Shriberg, 2006). To date there is no phenotype for CAS although there is general agreement that at its core is an impairment in planning and/or programming the spatio-temporal parameters of movement sequences. These space-time difficulties result in speech and prosodic errors and a characteristic receptive-expressive gap where the child with CAS has receptive language abilities that are superior to their expressive performance. Affected children exhibit speech errors including variable production of consonants and vowels in multiple repetitions of syllables or words (that is, token-to-token variability); lengthened and disrupted coarticulatory transitions between sounds and syllables; inappropriate prosody, especially when they come to apply stress to words or phrases (ASHA, 2007), and inconsistent application of nasal resonance (Shriberg Campbell, Karlsson, McSweeney, & Nadler, 2003).

The term CAS is applied to all presentations of apraxia in children, acquired and idiopathic. Although it is taking a little while to catch on in some parts of the world, "CAS" is now preferred by the research and clinical communities over more traditional labels like developmental verbal dyspraxia and "dyspraxia" which were usually only applied to idiopathic presentations.



Caroline Bowen

Web resources

Motor speech disorders in adults

Mindful of Speechwoman's words, it was delightful to find a classic article, **Rosenbeck and Wertz (1972)**⁴ on the treatment of AOS on the University of Pittsburgh site, **Julie Wambaugh**⁵ with contemporary guidelines for AOS intervention, and **Duffy (2008)**⁶ on motor speech disorders and the diagnosis of neurologic disease. It was also interesting to locate Motor Speech Laboratories at **Arizona State University**⁷, the University of Canterbury⁸ and the **University of Hong Kong**⁹.

Motor speech disorders in children

On the ASHA site **Hammer (2009)**¹⁰ writes about providing services in schools to children with CAS, **Strand and McCauley (2008)**¹¹ offer useful guidelines for differential diagnosis of severe speech impairment, **Gildersleeve-Neumann (2007)**¹² outlines the application of motor learning principles to intervention, and the jewel in the crown is the **ASHA (2007)**¹³ Technical Report and Position Statement.

Meanwhile, a review of intervention for CAS in the **Cochrane Collaboration**¹⁴ challenges the profession with news that their review, "demonstrates that there are currently too few well-controlled studies in this field to enable conclusions to be drawn about the efficacy of treatment for the entire CAS population, and calls for SLPs working in this area to design better studies." The collaboration makes a similar **call for research**¹⁵ into dysarthria in children and adolescents with acquired brain injury, saying there are "currently too few studies performed in this area to draw any conclusions about the efficacy of treatment for dysarthria in children and teenagers".

Other sites

The "other sites" Speechwoman shared came from three main sources: speech pathologists selling products and services; professional associations linking to sites with poor authority or credibility; and consumer groups disseminating opinion as fact. Two examples from the first category are **Sammy Speakwell's Oral Motor Therapy**¹⁶ for children (marketed to parents), and **Speech Therapy on Video**¹⁷ for adults with apraxia, aphasia, and dysarthria. In the second category, an ASHA consumer **information page**¹⁸ links to a consumer-advocacy site full of misleading and misguided claims. That site in turn links to an example in the third category, a publicly **social networking**¹⁹ page. It proclaims that fish oils are a treatment of choice for apraxia, that apraxia of speech in children is, according to "some authorities", a form of autism, and that "most [individuals] diagnosed with apraxia today also have co-existing sensory integration dysfunction or mild hypotonia."

Who cares?

In terms of the development of our profession, we are enjoined by our **Code of Ethics**²⁰ to participate, professional-to-professional, in "vigorous discussion and constructive criticism of our profession within appropriate professional forums, including conferences and publications." In such discussions many of us have sounded off, privately, among ourselves about practices we see as inappropriate, ineffective and even dangerous. But what is the ethical thing say when our clients ask if the likes of Sammy Speakwell, developed and sold by a fellow speech-language pathologist, might be beneficial for their children? When the partner of a person with a motor speech disorder asks about the advisability of buying an apraxia, dysarthria or oral motor exercises video to work with independently?

Do we care?

In 2009 the Ethics Board and Council of Speech Pathology Australia conducted a comprehensive **review**²¹ of the 2000 version of the Code of Ethics. Focus groups were consulted at our national conference and all members had the opportunity

to participate in a widely publicised survey. And what did we do? Well, 98.5% of us did nothing. Webwords and I won't be telling Speechwoman about this, of course. She'll only worry.

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Webwords 36 is at <http://speech-language-therapy.com/webwords36.htm> with live links to featured and additional resources.



Speech therapy services in Viet Nam

Past, present and future

Lindy McAllister, Nguyễn Thị Ngọc Dung, Janella Christie, Sue Woodward, Hà Thị Kim Yên, Đinh Thị Bích Loan, Bùi Thị Duyên, Alison Winkworth, Bernice Mathisen, Marie Atherton, Jacqui Frowen, Felicity Megee, and Trịnh Thị Kim Ngọc

Viet Nam is experiencing rapid economic and social change as it moves from an impoverished country engaged in postwar reconstruction to a rapidly growing Asian economy. At present, limited services for people with communication problems are offered by doctors, nurses, physiotherapists, and teachers, often trained in short courses by expatriate speech therapists. Like many developing countries, Viet Nam has a history of speech therapists visiting the country on volunteer placement for a few weeks to a couple of years, working with locals to provide specialist services and training. Increasing survival rates from stroke and degenerative diseases, rapidly increasing head injury rates, and a growing middle class has created a demand for formal, ongoing, government and private speech therapy services for people with disabilities and rehabilitation needs.

In this edition of ACQ, this regular column takes a slightly different tack on presenting information about speech pathology in the Asia Pacific basin. Earlier columns have been written by speech therapists about the established profession in that country. In this column, a number of Australian speech therapists and their Vietnamese counterparts tell their stories of their efforts to establish speech therapy in Viet Nam. We use the term “speech therapy” in this article as that is the term by which the profession is known in Viet Nam. Vietnamese health professions providing speech therapy services in hospitals in Ho Chi Minh City (HCMC, formerly Saigon) then tell their stories of developing and providing speech therapy services. We conclude this article with a consideration of possibilities for the development of a speech therapy profession in Viet Nam.

The earliest involvement of a speech therapist in Viet Nam, as reported in the literature (Landis & Pham, 1975) was in 1972, before reunification of the country. Miss Pat Landis (affiliated with the Division of Crippled Children’s Services, Maryland, USA) began a pilot project at the Children’s Medical Relief International Centre for Plastic and Reconstructive Surgery in Saigon. The 6-month program provided basic diagnostic and “remedial speech services” for patients with cleft lip and palate (CLP) and the training

of a Vietnamese counterpart. Services for children with CLP delivered by “fly in/fly out” teams are often the first step to the development of speech therapy in developing countries (see for example Zbar, Rai, & Dingman, 2000).

It was not until the early 1990s when Viet Nam opened its doors to the world that speech therapists again became involved with children with communication difficulties in Viet Nam. Since that time, a plethora of philanthropic organisations have donated their skills, time, and money to provide services and equipment for the hearing impaired, physically disabled, and for children with cleft lip and palate. These organisations have included Operation Rainbow, Operation Smile, The Smile Train, Mission Possible, and various projects sponsored by foreign embassies, religious organisations, and companies. Unfortunately, few have included the expertise and knowledge of a speech therapist on their teams.

Past and present

Lindy McAllister

DEPUTY HEAD, SCHOOL OF MEDICINE,
UNIVERSITY OF QUEENSLAND

DIRECTOR, TRINH FOUNDATION AUSTRALIA

I began working in Viet Nam in 2001, developing and running clinical education placements for allied health students from Charles Sturt University working at Phu My Orphanage in HCMC. Since 2001, more than 80 students from Charles Sturt University have provided needs assessments, intervention programming, staff training, resource development, and community awareness raising services in Phu My Orphanage, home to more than 350 children with physical and cognitive impairments (Clarke, Roberts, White, & McAllister, 2002; McAllister, Whiteford, Hill, & Thomas, 2006; Whiteford & McAllister, 2006; McAllister & Whiteford, 2008). This placement program won a Citation for Outstanding Contributions to Student Learning from the federal government’s Carrick Institute for Learning and Teaching in Higher Education in 2007. Our sustained engagement in Viet Nam has created networks to advocate for the development of speech therapy and allied health services more broadly in Viet Nam.

Over the years, I have provided consultancy to a number of Australian development and non-government organisation initiatives in Viet Nam, to Vietnamese government departments and hospitals, and to various universities in Viet Nam about establishing a speech therapy course in Viet Nam. This interest in developing speech therapy in Viet Nam brought me into contact with Australian speech therapist Sue Woodward. Through her work with Project

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EDUCATION

SPEECH
THERAPY

TRAINING

VIET NAM

Boomerang, an Australian cleft lip and plate charity, Sue found that the ENT Hospital in HCMC was keen to develop a short course in speech therapy, with a view to supporting a diploma course in one of the HCMC universities. Sue and I were able to persuade Janella Christie, Bernice Mathisen, Alison Winkworth, Jacqui Frowen, Marie Atherton, and Felicity Megee to contribute their expertise in cleft lip and plate, swallowing and voice, to the teaching of the first short course in speech therapy at the Ear, Nose and Throat (ENT) Hospital of HCMC in 2009, as described below.

Janella Christie

SENIOR SPEECH THERAPIST, ACUTE SPEECH PATHOLOGY SERVICE, SOUTHERN HEALTH-CLAYTON VIC

I first became involved with the Rotary Australia Viet Nam Dental Health Project in 2000. The project had begun in 1991 to improve the dental health of rural children and infants but broadened with the establishment of a specialist dental team as well as a cleft care team – Bridge the Gap Australia at the National Hospital of Odontostomatology and Maxillofacial Surgery in HCMC. We have begun to establish the concept of multidisciplinary management for patients with CLP. We have also been involved in a research project to determine the incidence of cleft lip and/or palate in newborn infants in the southern province of Ba Ria Vung Tau to assist with future service planning.

For a speech therapist working in a non-English speaking country, the challenges are numerous but never insurmountable, with the goal always being future sustainability of the service. The biggest hurdle to achieving this is the fact that there is currently no speech therapy training course in Viet Nam.

Sue Woodward

SPEECH THERAPIST IN PRIVATE PRACTICE,
CENTRAL COAST, NSW
DIRECTOR, TRINH FOUNDATION AUSTRALIA

Travelling to Viet Nam twice a year, I have been working as a self-funded member of the Project Boomerang team which provides staff training and multidisciplinary cleft care services to children in HCMC, Hoi An and Ha Noi.

In Hoi An, ongoing work with the Australian not-for-profit organisation Children's Hope in Action (CHIA) and with the government-run Hoi An Orphanage, involves the assessment and the planning of treatment programs for children not only with CLP, but also for those with wide ranging communication disorders. There has also been staff training at both institutions in all areas pertaining to communication disorders in children.

In Ha Noi, work at the National Hospital of Paediatrics has resulted in the establishment of a management protocol for all children born with CLP, which will now importantly include regular hearing checks and referrals to "speech nurses" who have been trained by us and other volunteers. Publication is currently underway of several booklets to assist parents and their children with varied speech and language difficulties including those with cleft lip and palate.

Working with the Project Boomerang team throughout Viet Nam has continually highlighted the critical lack of knowledge and expertise in all areas of child and adult communication disorders. The Trinh Foundation Australia (www.trinhfoundation.org) has therefore been established for the specific purpose of promoting and funding courses, particularly formal speech therapy training courses, to enable the effective management of communication and swallowing disabilities throughout Viet Nam. It is exciting to now see the expanding number of Australian speech therapists

willing to become involved in working in Viet Nam. The Trinh Foundation Australia hopes to provide ongoing support for these therapists as we work towards the goal of a university-based course for speech therapy in Viet Nam.

Hà Thị Kim Yến

HEAD OF PHYSICAL THERAPY & REHABILITATION
DEPARTMENT, CHILDREN'S HOSPITAL 1, HCMC

Until the last few years, most of the children I worked with at Children's Hospital 1 had cerebral palsy. They had difficulties with speech, but they could talk spontaneously when their patterns of feeding were corrected. In 2000, a 3-year-old child referred to me had received many assessments and treatments from the ENT doctor, but still had no speech at all. (I now realise she had autism.) Thus, my journey seeking information about speech therapy began. In 2002, I visited France for 10 weeks to learn how speech therapy is organised there. Back home, I organised a speech therapy unit in the Rehabilitation Department. Over time, I worked with many children with delayed speech. A neonatal department has been developed in the hospital and as a result, many more newborn babies have survived, increasing the need for speech therapy. In 2008, I was lucky to visit Arkansas Children's Hospital, as well as the Easter Seals service. I visited La Rabida Hospital in Chicago and learned from speech therapy sessions in schools there. In 2009, I attended the short course in speech therapy at ENT Hospital, HCMC, sponsored by the Trinh Foundation Australia. This has been a valuable, methodical training course.

At the Rehabilitation Department of the Children's Hospital 1, three speech therapy rooms were built with charity funds, and more than 300 children attend every year, including children with autism spectrum disorders (ASD), retarded development, lisps and cerebral palsy-post encephalitis. There are five speech therapy staff: four of them started as physical therapists, and one is a special educator. We are especially interested in early intervention and sensory integration therapy for children with ASD. We are learning to treat sucking-swallowing problems of newborn babies, as well as problems with chewing, drooling, picky eaters, and poor feeding patterns. Also, we need to build up our skills in working with preschool children with disabilities, improving their general skills of communication, and correcting their articulation if they have a cleft palate.

Đinh Thị Bích Loan

SPEECH THERAPIST, ODONTO MAXILLO FACIAL HOSPITAL (BVRHM), HCMC

I work as a nurse and speech therapist at the Odonto Maxillo Facial Hospital (BVRHM) in HCMC. This hospital provides free operations for many patients with CLP. After their operations, patients still have problems with voice, language and speech, but our hospital previously did not provide speech therapy. Since 2003, my hospital has been helped by Project Boomerang, and from 2007 by the Trinh Foundation Australia. I have had training from Mrs Sue Woodward in speech therapy for patients after CLP repair.

One of my typical patients is 10-year-old Quan. He had CLP which was repaired at about seven years of age. After that surgery, he still had nasal air emission during speech and he couldn't say many sounds, (for example "t" and "th"). But six months later, after receiving help for myself and from Project Boomerang speech therapists, the patient can say these sounds and use oral voice (editor's note: reduced hypernasality). I continue to practise sounds with Quan and advise his parents.

I was a participant in the 6-week speech therapy short course provided in 2009 by the Trinh Foundation Australia at the ENT Hospital in HCMC. I now have much more knowledge about how to treat patients. Now I am not just a nurse, I'm also helping some children with problems with voice, language, speech.

Bùi Thị Duyên

SPEECH THERAPIST AND NURSE, ENT HOSPITAL, HCMC

In 2003, I graduated from the Social Sciences and Humanities University (HCMC) with a Bachelor of Arts, and then in 2005 from The Medical Technology University Number 3 in HCMC with a Diploma of Nursing. At present I'm studying to obtain my Bachelor of Nursing at the Medical and Pharmacy University in HCMC. Now I am in charge of speech therapy training for patients with total laryngectomy, unilateral vocal cord paralysis, disorders of the breaking of voice, cleft palate, trouble with articulation, stuttering, and cochlear implants.

I spent nine months in Belgium at the Central Hospital of Liege and the Audio-Phonologie Medical Centre, learning how to provide therapy for children who have a cochlear implant, autism or memory problems. As well as my training in Belgium, I learned how to become a speech therapist from self-directed study, visiting speech therapists and from Dr Dung, the director of the ENT Hospital in HCMC.

One interesting group of patients I see here are those with total laryngectomy. We don't have access to voice prostheses here in Viet Nam, so the common treatment is oesophageal speech.

New developments

In the past, the development of speech therapy services in Viet Nam has been somewhat ad hoc, with volunteers providing speech therapy services or training of others to provide such services occurring in geographical isolation. When volunteers left there was often no means for sustaining gains made in that area. The current development of health, education and social services in Viet Nam, a growing awareness of what speech therapy can offer together with an escalating demand for speech therapy services creates an opportunity for nation-wide, coordinated, formalised and sustainable development of speech therapy services. In this section, Alison Winkworth, Bernice Mathisen, and Felicity Megee introduce themselves and describe a first step – a nationally delivered short course in speech therapy – to building a sustainable speech therapy service in Viet Nam.

Alison Winkworth

CASUAL LECTURER IN SPEECH PATHOLOGY PROGRAM, CHARLES STURT UNIVERSITY

SPEECH THERAPIST IN PRIVATE PRACTICE, ALBURY-WODONGA NSW/VIC

ADVISOR IN TEACHING AND LEARNING, TRINH FOUNDATION AUSTRALIA

In order to obtain some much-needed background and a cultural introduction, I travelled to Viet Nam in 2008 with Project Boomerang's Sue Woodward and colleagues on a reconnaissance trip for planning the short course. One of the most important aspects of this introductory trip was that I learned first hand about some of the key concepts, assumptions – and differences from Australian practice – in the predominant health care models practised in Viet Nam. I have since lectured and modelled patient care in Hanoi, and participated with team teaching the short course in speech therapy in HCMC.

Bernice Mathisen

SPEECH PATHOLOGY PROGRAM CONVENOR, THE UNIVERSITY OF NEWCASTLE, NEWCASTLE, NSW

Dr Aziz Sahu-Kahn, guest lecturer to the Bachelor of Speech Pathology Program at The University of Newcastle, consultant orthodontist to Project Boomerang and Trinh Foundation Australia director had invited me to Viet Nam five years ago. When Aziz's daughter Rehana graduated as a speech therapist from The University of Newcastle and Sue Woodward became a conjoint lecturer who would supervise two students in Viet Nam for two weeks, it was time for me to take up the standing invitation and "dive in to the unknown", quite literally. I had no experience of Viet Nam so decided to take a 10-day tour north (Ha Noi) to south (HCMC) with my family in February 2009, just before the short course started. This was a good move as it gave me a context and allowed me to start sampling the sensational Vietnamese food (for the swallowing module, of course!).

Felicity Megee

SENIOR CLINICIAN, HEAD & NECK ONCOLOGY, ACUTE SPEECH PATHOLOGY SERVICE, SOUTHERN HEALTH VIC

I had been aware of the work the Trinh Foundation was doing in Viet Nam for some time through speech pathology colleagues. However, it was not until July 2009, and the second clinical training block, that I became actively involved. An opportunity presented initially as a clinical educator, and later as a lecturer. I found the opportunity to use my skills in speech pathology in a different context was both exciting and challenging. The clinical training block raised important questions regarding communication and dysphagia management for patients undergoing head and neck cancer treatment in Viet Nam. A visit to Benh Vien Ung Buou, the cancer hospital in HCMC, and further discussion with health professionals working with a head and neck cancer population ensured that some of these questions could be addressed in the October lecture block.

The short course in speech therapy

At the request of the ENT Hospital of HCMC, Trinh Foundation Australia organised, financially supported and delivered a 6-week course in key topics in speech therapy (voice, swallowing and speech) to 19 doctors, nurses, audiologists and physiotherapists from the major hospitals in Viet Nam. Proficiency with spoken or written English was not a prerequisite for course entry. Almost all these students were already working with people with communication and swallowing impairments. Eight Australian speech therapists volunteered their time to lecture and provide clinical teaching sessions at different points in the course. We worked with interpreters, at first one of the participating doctors, later Vietnamese-Australian interpreters sourced by Trinh



Dr Bernice Mathisen and Felicity Megee working with a patient as the participants in the short course in speech therapy look on.



Participants in the short course in speech therapy with the lecturers

Foundation Australia, one of whom was an Australian speech pathologist volunteer.

Two 2-week teaching blocks combining theory integrated with practice principles were conducted in February and October 2009. Two 5-day clinical training periods were run in March and July. Each course participant was required to attend all of the academic teaching periods, and one week of clinical training. Australian speech therapy lecturers and clinical educators working in teams presented each teaching period.

Course content and style

Planned in conjunction with all project team members including Dr Dung (see her own reflections later in this article), the first 2-week block taught in February 2009 was designed to include the following topics: principles and processes of speech therapy practice; the implications for practice of essential anatomy, physiology and neurology for speech, swallowing, voice, and hearing; an overview of speech and language development; hearing and its implications for communication impairments; an introduction to speech therapy with head and neck cancer patients; and assessment and treatment of cleft lip and palate, voice and swallowing disorders, in both adults and children.

The teaching methods were as varied as we could possibly make them. Small group work, case-based learning, role plays, case presentations, group problem-solving and discussions were all used – methods which were all unfamiliar to the course participants. These were in addition to practical demonstrations and trials, and demonstration modelling and clinical teaching with volunteer patients. Thus, while this period was designed as principally “academic teaching”, the learning was as experiential as possible. Team teaching became the “modus operandi” and often it grew organically as the speech therapy lecturers gained trust, experience and confidence with each others’ preferred teaching style.

An example of a practical demonstration was the “normal swallowing practical”. Dr Bernice Mathisen (responsible for the dysphagia component of the course) had organised with course participants and the hospital kitchen for individual portions of a range of Vietnamese food consistencies to be served during a teaching session on swallowing and swallowing disorders. A variety of delicious Vietnamese dishes was presented to the students, ranging from the internationally known Vietnamese specialty, noodle soup (pho), to rice dishes, sweet biscuits, honey, and desserts based on agar-agar. Course participants working in pairs offered food and fluids to each other, in a role-play situation, observing a number of normal parameters, such as the role of texture or positioning, reflecting and discussing afterwards the effects on normal adult swallowing. This session was particularly well received as food and eating play a major role in social participation in Viet Nam.

The week-long clinical training sessions in March and July 2009, led by Sue Woodward and co-taught with Marie Atherton, Jacqui Frowen (March) and Felicity Megee (July), were also successful, as participants were keen to apply their knowledge and skills. The experience has fundamentally changed the Australian lecturers and clinical educators, giving them not only a new teaching role and peers with a shared passion for this innovative work but also an international perspective of speech therapy, one which is more inclusive of students who are culturally and linguistically different to those typically found in courses in Australian universities. The outcomes for the participants will be reported in a forthcoming paper on evaluation of the course.

Several evaluation, reflection and feedback sessions with staff and participants informed both development and revision of the course as it progressed, so that the content and teaching processes in the second 2-week teaching block held in October 2009 directly targeted participants’ learning needs as they changed throughout the course. In the content, for example, four key unifying themes of clinical processes (derived from the feedback) were used as a basis for teaching in each of the specialist speech therapy topics (such as dysphagia, speech, language, cleft lip and palate). These themes were: diverse team practice, clinical reasoning, therapy planning, and working more effectively with patients. A problem-based learning approach was used in every teaching session.

Assessment of participants was continuous throughout the clinical teaching, and they were also required to submit detailed patient case reports. A selection of these case reports was then used in the final teaching block to inform individual oral viva examinations, so that participants’ deep learning was examined.

The future

To the best of our knowledge, the first Vietnamese national who is fully qualified as a speech therapist has recently returned to Viet Nam. She shares some of her work below.

Trịnh Thị Kim Ngọc

SPEECH THERAPIST AND VICE-DEAN, FACULTY OF SPECIAL EDUCATION, THE NATIONAL COLLEGE OF EDUCATION, HCMC

In 1999, I graduated from Da Nang University of Education, with a 4-year degree majoring in English. I obtained a BSc in Special Education in 2002 at Ha Noi University of Education, and majored in working with children with hearing impairment (HI). After my second degree, I worked as a researcher at the Centre for Children with Disabilities (CwDs), Institute for Education and Research in HCMC. Then I worked as an assistant to the program officer who led inclusive education programs for CwDs at the Save the Children (Sweden) project in Ha Noi. Since 2004, I have been working as a lecturer at the Faculty of Special Education, the National College of Education in HCMC. I taught the audiology module and language development for children with HI and was a leader of the HI Team before going to England in 2007.

I completed an MSc in human communication sciences at Newcastle-upon-Tyne University in September 2008. I got a scholarship from the Ford Foundation International Fellowships Program with a dream of supporting children with language difficulties. Since I started working with children with different types of disabilities, I have realised that the majority of CwDs have speech and language disorders. My dissertation was compiling a vocabulary checklist for Vietnamese parents so they can assess their children’s language development and identify late-talkers in children from 18–36 months of age.

Currently, I am vice dean in the Faculty of Special Education and train students who will be teachers at special and inclusive schools and children's hospitals. I teach courses in audiology, language development for children with HI, early intervention and inclusive education for CwDs, and how to educate children with language difficulties. In addition, I have been directly supporting children with language difficulties and consulting with parents. I am interested in working with children with HI and children who stutter. I would love speech-language therapists in foreign countries, especially Australia, to share the Lidcombe Programme with us. I have studied its theoretical framework but have not yet been trained to implement it. It is crucial for Viet Nam to develop formal training courses for teachers to teach them how to help develop language for the children they work with, and for doctors and nurses who work with people with communication impairments. We also need to develop research programs in communication development and impairments in Viet Nam.

Nguyễn Thị Ngọc Dung

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I am director of the ENT Hospital in HCMC, responsible for ENT patients in the south of Viet Nam as well as HCMC. Our hospital also has a role in teaching medical students and postgraduate doctors who study to become ENT specialists. I am also the professor and chairperson of the ENT Department at the Medicine and Pharmacy University and vice chairperson of the ENT Department of the Municipal Medical University Pham Ngoc Thach, both in HCMC. In addition, I have served as president of the National Vietnamese Otolaryngological Society since 2004.

I spent 1992 in Lyon, France as an ENT intern in the Hospital Edouard Herriott. Where I worked had an audiophonology department which trained speech therapists, so in the afternoons, after finishing my work as an ENT doctor, I followed the speech therapists to learn how to work with their patients. I have continued to read and study about speech therapy since then. When I came back to the ENT Hospital in HCMC, I trained three nurses to work with the patients, using knowledge from French textbooks and what I had learned from the speech therapists in France. I have asked visiting doctors from France, Belgium, and the Philippines who are specialised in speech or voice rehabilitation to organise short courses and train our speech therapists. The speech therapists also develop their own learning through practice and readings.

At the ENT Hospital, we see many patients who need speech therapy and we cannot treat all of them due to the lack of knowledge and lack of staff. We need a formal speech therapy course. Fortunately I have met people in Project Boomerang and the Trinh Foundation Australia – Dr Aziz Khan, Mrs Sue Woodward, and later Professor Lindy McAllister. They have worked with me to develop a 6-week short course in speech therapy (described earlier in this article).

There is a growing demand in Viet Nam for speech therapy services. Currently, speech therapy is offered by doctors, physiotherapists, nurses and some technicians who have undertaken short courses in speech therapy, offered by visiting speech therapists from Australia, USA, France and the UK. So, for the whole country, we need

academic training of professional speech therapists with a 4-year baccalaureate degree or a 2-year postgraduate degree. With the help of Australian speech therapists via the Trinh Foundation Australia and Project Boomerang, we will set up the beginnings of a long-term training program and the graduate speech therapists will continue our mission of training, and help improve the quality of life of our patients. A Memorandum of Understanding with Pham Ngoc Thach (Municipal) Medical University was signed on 13 October 2009 to commence a full-time, 2-year postgraduate diploma in speech therapy in late 2010. The university will need considerable support from volunteer Australian speech therapists to provide a high quality course until their graduates can be trained to take over running of the course.

Summary

A growing cadre of partially trained and fully qualified speech therapists in Viet Nam, together with a demand for speech therapy services in public and private facilities points to a future of developing and sustaining a speech therapy service and profession in Viet Nam. The Australian and Vietnamese speech therapists who have co-written this article are actively working together with their respective hospitals, universities and governments to create a sustainable university-based degree in speech therapy, based initially in HCMC. Development of the curriculum and academic governance processes for the program is well underway, with the vital support of the ENT Hospital of HCMC and The Trinh Foundation Australia. Achievement of this goal will require support from Australian speech therapists to help resource the program and provide teaching of the first cohorts of students, and later for ongoing professional development for the new graduates.

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Max's House Top 10 resources for paediatric motor speech intervention

Kieran Flanagan and Emma Laube

MAX'S HOUSE IS A NOT-FOR-PROFIT PRIVATE SPEECH pathology clinic in Brisbane offering intensive therapy specialising in childhood apraxia of speech (CAS) and related conditions (www.maxshouse.com.au). The top 10 resources we have compiled are a snapshot of the eclectic mix of resources in our therapy tool box which we have acquired over time from experts in the field of motor speech disorders including Edyth Strand, David Hammer, the PROMPT institute and Nancy Kaufman.

1. CASANA Apraxia Kids Website

The Childhood Apraxia of Speech Association of North America is a non-for-profit organisation which was established by the inspirational mother, Sharon Gretz. This website (www.apraxia-kids.org) has information for everyone affected by CAS including a library, resources, and discussion forums for parents and professionals.

2. Clinical Management of Motor Speech Disorders in Children

Caruso, A. J., & Strand, E., A. (1999). *Clinical management of motor speech disorders in children*. New York: Thieme.

All too often, books written for speech pathologists are criticised for being either too “theoretical” or, alternatively, full of useful ideas for the clinical setting but lacking a firm evidence base. *Clinical Management of Motor Speech Disorders in Children* is indeed a rare book in that it provides in depth theoretical information of the working of the motor speech system and describes, in very practical terms, how to work with children with motor speech disorders.

3. Treatment Strategies for Childhood Apraxia of Speech with David W. Hammer

UPMC Medical Media Services (Producer). (2006). *Treatment strategies for childhood apraxia of speech with David W. Hammer*, M.A., CCC-SLP [Motion picture]. USA: Children's Hospital Pittsburgh & CASANA.

Children who have CAS need drill therapy. Drill therapy is boring (no pun intended). That is, until you've seen the work of David Hammer. David Hammer is a speech pathologist and CAS expert who has given workshops around the world on the assessment and treatment of CAS based on the principles of motor learning. On the *Treatment Strategies for Childhood Apraxia of Speech* DVD, he presents effective and fun techniques for treating children with this disorder.

4. Kaufman Speech Praxis Test for Children

Kaufman, N. (1995). *Kaufman speech praxis test for children*. West Bloomfield, MI: Wayne State University Press.

This test developed by Nancy Kaufman offers an easy-to-administer assessment of children who are attempting to imitate oral movements and/or speech. The key areas

when assessing children with motor speech disorders are observed including sound inventory, word structure, impact of length and complexity of utterance, and oral motor movement.



5. Sign Planet Website

When working with children with CAS we utilise Makaton key word signing as a part of therapy to support their verbal attempts, to encourage language development and to provide them with a visual cue for the words and phrases we are encouraging. The website www.signplanet.net offers an easy-to-use dictionary of Auslan signs. It includes a written explanation as well as a picture and some animated videos of the signs. Printable worksheets and games are also available.



6. First Sound Series Books

By Levinia Pereira and Michelle Solomon. Available from www.firstsoundseries.com.

These fun books were developed by two speech pathologists and can be ordered on-line. With titles such as *Pop Up!* and *Uh-oh* these books are repetitive and predictable, providing the opportunity for repetition of functional vocabulary, speech targets, and carrier phrases required for motor speech development.

7. Super Duper Token Tower

Motivating children to produce hundreds of accurate repetitions of speech targets while having fun at the same

time is always a challenge. The Super Duper Token Tower is one way to show children that they are meeting their goals and provide them with a sense of achievement. The tower can be used in a variety of ways: children can set their own goals, you can have a competition, work towards a reward or collect the smiley faces and watch to see which side it lands on. Token Towers can be purchased from www.superduperinc.com

8. Systems Analysis Observation: Structure, Function and Integration

Hayden, D. (2006). *PROMPT introduction to technique: A manual*. Santa Fe, NM: The PROMPT Institute.

Speech pathologists who work with clients with motor speech disorders would be well served to attend an introduction to PROMPT Technique workshop. PROMPT workshops teach therapists many skills in the assessment and treatment of motor speech disorders. PROMPT assessment techniques determine at what level an individual's motor speech system is breaking down and also identify where therapy needs to start.

9. SmartTalk SmartCards

When providing therapy for children with a motor speech disorder, choosing vocabulary can be difficult as there are so many parameters to consider. This is especially true when

using PROMPT as it encourages clinicians to select therapy targets based not only on sounds but also on other factors such as phonotactic structures, planes of movement, and relevance to the clients. The SmartTalk SmartCards provide vocabulary items that are organised with respect to the PROMPT motor speech treatment hierarchy. There are five different decks of SmartCards, each targeting a different stage of the hierarchy. Find out more at <http://smarttalk.info/smartcards.html>

10. Video camera

Speech is as much about movement as it is about sounds. A thorough analysis of an individual's speech documents both the sounds made and the associated movements of the articulators. Based on these assumptions, a tape or mp3 recorder is not sufficient when collecting a speech sample, especially when the assessment involves a person with a suspected motor speech disorder. A video camera provides a great way to collect a speech sample that you can later analyse to see what sounds a client made and how they were made.

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Around the journals

Principles of motor learning

Maas E., Robin, D., Austermann Hula, S.N., Freedman, S. E., Wulf, G., Ballard, K. J., & Schmidt, R. A. (2008). Principles of motor learning in treatment of motor speech disorders. *American Journal of Speech-Language Pathology*, 17, 277–298.

Erin Godecke

At last! An article that incorporates all you need to know about treating apraxia of speech (AOS). This tutorial-based article incorporates a critical review of existing AOS literature and presents a theoretical framework to better guide clinical management of the disorder. The authors describe the founding principles of general motor learning and go on to apply these principles to speech motor learning. Essential to the development of the links between speech and general motor learning is the concept of “learning versus performance”, which the authors believe to be intimately associated with the holy grail of all speech intervention, namely “improved generalisation and carryover”.

The authors draw heavily on the “Schema Theory” (Schmidt, 1975, 2003; Schmidt & Lee, 2005) which assumes that in the intact motor learning system, motor programs are retrieved from memory and subsequently adapted to a specific situation. The motor programs are shaped and honed with increased practice and eventually stored as learned chunks of behaviour. The authors postulate that the principles of motor learning (Schema Theory) extend to impaired speech systems, and demonstrate that with optimal conditions of practice, improved generalisation and carryover can be achieved. Additionally, the authors present a synopsis of the “Challenge point framework” by Guadagnoli and Lee (2004) which augments the theoretical underpinnings of the Schema Theory and introduces the concept of optimal (motor) learning environments to treatment of AOS.

In order to assimilate a large amount of theory, the authors discuss key issues, including the structure of practice, attentional focus, movement complexity, and feedback type. The structure of practice is partitioned into: 1) amount, which refers to the overall time spent practising the movements; 2) distribution, which is how the practice is apportioned over time; 3) variability, which describes practice performed in different variations; and 4) schedule, which refers to different movements being used to achieve an unpredictable target. Attentional focus relates to either the internal focus, which is concentrating on kinetic, kinematic, and somatosensory information; or the external focus which describes attention to movement of an object (e.g., golf club) to achieve a goal. Movement complexity relates directly to the Challenge point framework and breaks tasks into simple (part) or whole (complex) movements. Feedback type is divided into knowledge of results (KR) and knowledge of performance (KP). KR is information about the movement outcome, in relation to the goal (provided at the completion

of the movement). KP is information about the nature or quality of the movement. It includes biofeedback and external feedback provided by an instructor (clinician). The article draws on extensive literature regarding the nature of feedback frequency, intensity, and timing.

Having dissected this complex theory, the article finally draws together the above concepts and discusses the clinical implications when applying it to the people we treat on a daily basis. It provides a case example and shows how intervention may be constructed to improve motor speech outcomes for people with AOS. While I believe there is still much to learn about the motor speech system and how to help repair it once it is broken, this article goes a long way to bridge the divide between principles of learning, practice, feedback, and attention with motor speech production.

Included below is the “shortlist” of key articles that form a comprehensive reading list to help unlock the mysteries behind AOS. I hope you enjoy!

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Investigating word intelligibility in Parkinson’s disease

Neel, A. (2009). Effects of loud and amplified speech on sentence and word intelligibility in Parkinson disease. *Journal of Speech, Language and Hearing Research*, 52, 1021–1033.

Kylie Mulcahy

In management of hypokinetic dysarthria related to Parkinson’s disease, the effects of increased vocal effort (or loud speech) as opposed to simple amplification are unclear. In this study, the authors aim to explain the mechanisms that contribute to deficits in speech intelligibility by dichotomising

amplification with loud speech to establish the most effective method of communication.

The intelligibility of habitual, loud, and amplified speech in five speakers with Parkinson's disease was assessed by reading 20 sentences under each of the above conditions. These speech samples were then randomised, and listeners were asked to rate the intelligibility of sentences. Acoustic analysis was also performed. Results demonstrated a significant effect for stimulus type, with loud sentences deemed more intelligible than amplified ones, which were in turn more intelligible than the habitual sentences. There were also direct changes observed in phonatory and articulatory behaviour with increased vocal effort. This suggests that increased intensity alone accounts for some, but not all, improvements in intelligibility with vocal effort.

In order to determine which phonatory and articulatory changes contribute to better intelligibility ratings, a word transcription task was used to focus on potential phonetic changes. Loud words were transcribed more accurately than amplified words, and amplified words were transcribed more accurately than habitual ones.

Overall, the article provides evidence that there are benefits in both loud speech and amplification for dysarthria in Parkinson's disease. Changes in articulation contribute to increased intelligibility in loud speech. Careful documentation of changes in articulation, resonance, voice quality, and prosody during treatment is recommended to demonstrate how these changes affect listeners, as it appears that other aspects aside from simple loudness need to be addressed. Future research could possibly examine prosody and voice quality more closely. The possibility of any carryover effects to the swallowing mechanism as a result of increased vocal effort would present another relevant opportunity for investigation.

Acoustic voice analysis in dysarthria following stroke

Wang, Y., Kent, R., Kent, J., Duffy, J., & Thomas, J. (2009). Acoustic analysis of voice in dysarthria following stroke. *Clinical Linguistics and Phonetics*, 23(5), 335–347.

Kylie Mulcahy

As speech pathologists, we understand our clients with dysarthria in a multitude of ways. In those with stroke-related dysarthria, however, the exact profile of underlying involvement is often difficult to demarcate with evidence of laryngeal hypo- and hyper-function existing. This study conducted by reputable authors aims to establish the profile of voice dysfunction in stroke-related dysarthria, using objective instrumental analysis of voice. The authors hypothesised that participants with stroke-related dysarthria would have differing phonatory abilities when compared against young and elderly speakers.

A total of 61 individuals (diagnosed with dysarthria following stroke) provided speech samples for analysis, from which 15 acoustic parameters were obtained. These were compared with normative data from previous literature across three gender-split groups (speakers with stroke, healthy elderly speakers, and healthy young speakers). Results indicated that the primary acoustic effect of stroke on both the male and female voice is an increased noise measure (soft phonation index). Although the exact clinical applicability of soft phonation index is unclear, it has been shown to correlate perceptually with various dimensions

(including breathiness) and different states of vocal adduction. Generally, the voice acoustic characteristics of speakers with stroke-related dysarthria were similar to those of healthy ageing speakers – a surprising finding.

The results from this study suggest that the effects of stroke on the voice are minimal compared to the effects of aging. It is possible, though, that subgroups exist with more serious vocal pathology. The results may therefore be a conservative indication of the degree of impairment, and do not address the concomitant impact on activity and participation in daily living. However, they demonstrate the importance of using a combination of both perceptual and acoustic analysis in the clinical assessment of dysarthria following stroke. Future studies will better enlighten the exact profile of voice dysfunction in this group.

Functional characteristics of children diagnosed with CAS

Teverovsky, E. G., Bickel, J. O., & Feldman, H. M. (2009). Functional characteristics of children diagnosed with childhood apraxia of speech. *Disability and Rehabilitation*, 31(2), 94–102.

Lara Lambert

Childhood apraxia of speech (CAS) is a severe childhood speech sound disorder with difficulty in sequencing movements required for speech production. In this article the authors show that the International Classification of Functioning Disability and Health – Children and Youth (ICF-CY) can be used as a framework to describe the functional characteristics of children with CAS. A total of 192 parents of 2- to 15-year-old children with CAS were asked to fill in a survey consisting of 61 items. Apart from questions tapping demographic information, including past or current medical, developmental, and mental health issues, the survey included 43 items based on the World Health Organisation's systematic description of how young children function in the home and school contexts (i.e., their body functions, performance of daily living activities and social participation). Through descriptive statistics and exploratory factor analysis, four main factors were identified within the broad range of functional problems in children with CAS: 1) cognitive and learning problems included learning through play, literacy (learning to read, spell and write), calculations in numeracy, and memory; 2) social communication difficulties comprised comprehension of verbal and non-verbal messages, undertaking a task, and interpretation of context (including danger), as well as producing a non-verbal message; 3) behavioural dys-regulation encompassed management of behaviour, temperament, and emotions, which influence performance in educational and social environments; 4) other oral motor problems included difficulties with eating and drinking.

The authors' self-critique of limitations of the study include its dependence on parental reports of diagnoses and descriptions and its non-representation of lower socioeconomic families. However, the ICF design on which the study was based has been constructed to minimise cultural and linguistic bias and has been field tested. While speech sound difficulties in young children may resolve, learning and social challenges may persist and the functional analysis using the ICF-CY may be useful for a multidisciplinary team in assessment, intervention, and monitoring of children with CAS.

Speech pathology resources

Norbury, C. F., Tomblin, J. B., & Bishop, D. V. M. (Editors). (2008). *Understanding developmental language disorders: From theory to practice*. New York: Psychology Press. ISBN 978 1 841696676 (soft bound); pp. 232; A\$72; available from Palgrave Macmillan.

Marleen Westerveld

This book contains 13 chapters related to developmental language disorders, mostly written by world-renowned experts, including Dorothy Bishop, Gina Conti-Ramsden, Charles Hulme, Kate Nation, Courtenay Frazier Norbury, and Margaret Snowling. Most of the content of the chapters was presented at the 4th Afasic International Symposium, held in April 2007, at the University of Warwick. As the title proclaims and the foreword explains, this book aims to provide the reader with an update of the literature relating to "key questions parents ask when their child is diagnosed with a developmental language disorder" (p. ix). Fulfilling that promise, the book covers topics ranging from identification and assessment of language impairment to long-term outcomes and intervention.

The first six chapters of the book address the assessment of children suspected of a developmental language disorder. Apart from two more traditional chapters discussing general terminology and short-term memory difficulties, there are some fascinating chapters investigating other areas related to language disorders. For example, in chapter 3, Kate Nation explains how the measurement of children's eye movements can be used to investigate children's weaknesses in language processing. Chapter 4 looks at the use of magnetic resonance imaging (MRI) to investigate developmental language disorders and contains a useful overview of the mechanics of MRI, whereas chapters 5 and 6 discuss results from genetic studies related to specific language impairment.

The next three chapters deal with longer term outcomes of children with developmental language impairment. For example, in chapter 7, Bruce Tomblin reports the data obtained from tenth grade adolescents from his well-known longitudinal epidemiologic study of specific language impairment. The participants are divided into groups based on language status at kindergarten age: 1) specific language impairment, 2) general delay, and 3) typically developing. Results are presented in the areas of academic competence, social skills competence, rule-abiding conduct, as well as sense of well-being. In chapter 8, Gina Conti-Ramsden provides the outcomes at age 16 of her longitudinal study of children who first presented with language impairment in grade 2.

The last chapters of the book address different types of intervention for children with language impairment. Topics include improving grammatical skills in children with language impairment, providing reading intervention for children with language learning difficulties, and how



to intervene with children with pragmatic language impairments. The authors of each of these chapters consider the available evidence and provide practical suggestions for clinical practice and future research.

In summary, this book provides an excellent compilation of recent research related to developmental language disorders. It would be a valuable resource for clinicians, postgraduate students and researchers in speech pathology who are interested in this particular area.

Hiebert, E. H., & Sailors, M. (2008). *Finding the right texts: What works for beginning and struggling readers*. New York, The Guilford Press. ISBN 978 159385 885 8; pp. 266; A\$46.95; www.footprint.com.au

Julie Marinac

This book appears to be well researched and written, with 19 contributors whose work is drawn together skilfully by the editors. Hiebert and Sailors have divided the contents into three broad aims: 1) an in-depth view of "text" construction, use, and genres; 2) text knowledge per se; and 3) the paucity of research-based study in this area. In addition, this work appears to have three primary reader targets: 1) those who determine text and curricular requirements at overall policy levels in schools; 2) those who determine, at local school authority levels, resource selection to meet those requirements; and 3) those who work in the classroom to meet student and curricular needs and expectations. Overall, Hiebert and Sailors appear to have achieved these aims, with particular success both in the first area of study (i.e., the study of "text" per se) and in the first readership group (i.e., at the policy level).

The initial chapters may be useful and very informative as a reference text for those charged with curricular development and guidance. Unfortunately, this section is very densely written with a great deal of genre-specific language that is unfamiliar to many educators. This, combined with a very heavy cultural bias (USA-based information), may limit the book's value for local educators.

In subsequent chapters, definitions, strategies, and direct advice to enable text modifications for individual and groups of students are given. These provide assistance for those who are seeking to match delayed reading skills with age-appropriate, and curricular-demanded, linguistic and content text structures. Once again, these are presented as individual chapters from contributors that are centred on specific populations (e.g., science-based text reading or ESL students learning to read English). This information should prove valuable to classroom teachers who are expected to recommend, select, and/or adapt set text materials for cross-curricular literacy learning.

The bottom line: one for the regional office or staff room library rather than for individual teachers or speech pathologists.



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Articles should not usually exceed 2500 words (including tables and references). This is equivalent to approximately 11 double-spaced pages. Longer articles may be accepted, at the discretion of the editors.

Format

The article should be submitted electronically via email (as an attachment). One hard copy and a copy on disk (preferably in Microsoft Word) is required if the article contains symbols (e.g., phonetic font).

The title page should contain the title of the article, the author's name, profession, employer, contact phone number and correspondence address, as well as a maximum of five key words or phrases for indexing.

The format must be double spaced with 2.5 cm margins, in a serif face (such as Times or Courier), each page numbered sequentially.

CDs must be clearly marked with file name, author's name and program used, including version number and whether PC or Macintosh (e.g., MS Word 2007 IBM). Each table or figure must be in a separate file on the disk. Do not incorporate figures or tables within the text of the article. Formatting must be kept to a minimum. Do not use tabs, bold or other highlighting of the text. References must appear at the end of the article. The first line of each paragraph should be indented. Do not right justify the text. Use one space after punctuation, including full stops. Double quotes should be used.

Peer review

Articles submitted to ACQ may undergo a double blind peer review process if: (a) requested by the author(s), or (b) requested by the editor.

If peer review is requested, the article will be sent to two reviewers. The authors will be provided with information from the review process and will be invited to revise and resubmit their work if this is indicated. The sentence "This article was peer reviewed" will appear after the title for all peer reviewed articles.

Style

Clear and concise writing is best. Use short sentences and paragraphs and plain English.

Reproduce any quotations exactly as they appear in the original and provide the page number(s) for the pages you have quoted from.

References, which should be kept to a minimum, should follow the American Psychological Association (APA 5th ed.) style.

The title should be kept as short as possible (maximum 80 characters).

Headings should be short. Within the article a maximum of two levels of headings should be used. For first level headings use all capitals, centred with one line space above and one line space below. For second level headings use a capital letter for the first letter of the first word only, centred with one line space above and one line space below.

Tables and figures

If there are to be tables or figures within your article, these should be printed on separate sheets with a clear indication of where they are to appear in the article. All tables and figures should be numbered. Figures should be presented as camera-ready art. Do not incorporate tables or figures within the text of the article. Digital images should be sent as uncompressed TIF or EPS files.

Abstract

Please include an abstract of approximately 100 words describing your article.

Biographical information

Please include approximately 15 words about yourself and a clear photograph of yourself. This can be a casual or formal shot. A good quality print or slide is acceptable. These should be labelled with your name on a sticky label on the back. To avoid impressions damaging the back of the photo, write on the label before it is attached to the photo. Digital photos should be uncompressed TIF or EPS files.

Article submission form

If your article is accepted for publication, it will only be published if the "Article Submission Form" and "Copyright Warranty and Assignment" are completed and signed (please contact National Office for these forms) or go to

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